k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Michelle's Accounting Company.

Number of Bookkeepers	Total Product per Hour
1	8
2	20
3	40
4	55
5	65
6	70
7	65
8	55

(a) After which bookkeeper do diminishing marginal returns begin for Michelle's Accounting Company? Explain using numbers.

(b) Assume Michelle's Accounting Company sells its accounting services in a perfectly competitive market at a price of $20. Calculate the marginal revenue product of the sixth bookkeeper. Show your work.

(c) Michelle's Accounting Company hires bookkeepers in a perfectly competitive labor market for bookkeepers at a wage rate of $110 per hour, and the market price of services remains $20. How many bookkeepers will Michelle's Accounting Company hire to maximize its profit? Explain using marginal analysis.

(d) Assume bookkeepers and accounting software are substitutes in providing accounting services by all accounting firms in the market. If accounting software, a fixed input, becomes less expensive and Michelle's Accounting Company provides the same quantity of accounting services, will each of the following increase, decrease, or stay the same?
(i) The wage rate Michelle's Accounting Company will pay its bookkeepers. Explain.
(ii) The demand curve for bookkeepers for Michelle's Accounting Company. Explain.

1. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin after the third worker and explains that the marginal product (MP) of the fourth worker (15) was less than the MP of the third worker (20).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the sixth worker as \$100 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$20 \times 5 = \$100$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 5 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 5^{th} worker (\$200) is greater than the marginal resource cost (MRC) or wage (\$110), but the MRP of the 6^{th} worker (\$100) is less than the MRC (\$110).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the wage rate the firm will pay will decrease and explains that a decrease in the price of accounting software will result in a decrease in the demand for workers because accounting software and workers are substitutes in providing accounting services. A decrease in the demand for workers will decrease the market wage and therefore decrease the wage rate paid by the firm because the firm is a wage taker.

k

· States that the demand curve for bookkeepers by Michelle's Accounting Company will stay the same in the short run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP), which is the price of the service times the marginal product, and in the short run there is no change in the price of the service or the marginal product.

Or states that the demand curve for bookkeepers by Michelle's Accounting Company will decrease in the long run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP) which is the price of the service times the marginal product, and a decrease in the price of an input will increase the supply of accounting services in the market, which will decrease the market price of accounting services, and therefore will decrease the marginal revenue product for every unit of labor.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Ahmal's Manufacturing Company.

Number of Machinists	Total Product per Hour
1	20
2	45
3	75
4	110
5	150
6	180
7	200
8	198

(a) Beginning with which machinist do diminishing marginal returns set in for Ahmal's Manufacturing Company? Explain using numbers.

(b) Assume Ahmal's Manufacturing Company sells its goods in a perfectly competitive market at a unit price of $3. Calculate the marginal revenue product of the third machinist. Show your work.

(c) Ahmal's Manufacturing Company hires machinists in a perfectly competitive labor market for machinists at a wage rate of $40 per hour, and the market price of services remains $3. How many machinists will Ahmal's Manufacturing Company hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is a decrease in the productivity of all workers in the labor market for machinists. What will happen to each of the following in equilibrium?
(i) The number of workers hired in the labor market for machinists. Explain.
(ii) The wage rate Ahmal's Manufacturing Company will pay its machinists. Explain.

2. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin with the sixth worker and explains that the marginal product (MP) of the sixth worker (30) is less than the MP of the fifth worker (40).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the third worker as $90 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$3 \times 30 = \$90$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 7 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 7th worker ($60) is greater than the marginal resource cost (MRC) or wage ($40), but the MRP of the 8th worker ($-\$6$) is less than the MRC ($40).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the number of workers hired in the labor market would decrease and explains that a decrease in the productivity of workers will decrease the demand for labor in the market for machinists.

· States that the wage rate Ahmal's Manufacturing Company will pay will decrease and explains that the decrease in the

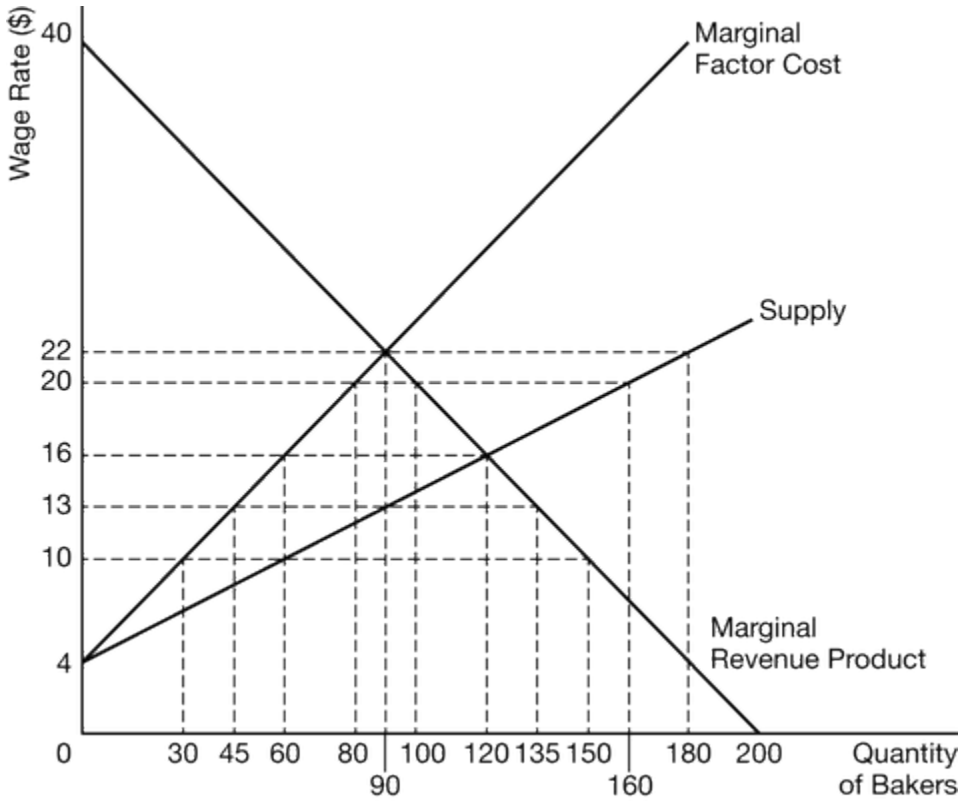
k

market demand for labor will decrease the market wage, which decreases the wage rate paid by the firm because the firm is a wage taker.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Bobby's Bakehouse is the only bakery in a small remote town, and Bobby's Bakehouse is the only employer of bakers in the area. The graph below shows the market for bakers with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) If the wage rate is $13, state whether there will be a shortage or a surplus of bakers and calculate its size. Show your work.

(b) Identify the profit-maximizing number of bakers that Bobby's Bakehouse will hire. Explain using the labeling on the graph.

(c) Identify the profit-maximizing wage rate that Bobby's Bakehouse will pay its bakers. Explain using the labeling on the graph.

(d) If the marginal product of bakers increases, what will happen to the quantity of output produced by Bobby's Bakehouse? Explain.

(e) Assume instead that Bobby's Bakehouse uses both labor and capital in its production of baked goods. The marginal product of the last unit of labor hired is 16 baked goods per hour and the marginal product of the last unit of capital rented

k

is 50 baked goods per hour; the hourly wage rate for labor is $8 and the hourly rental price for capital is $5. To minimize the cost of producing its current level of output, should Bobby's Bakehouse rent more capital, less capital, or the same amount of capital? Explain using marginal analysis.

3. Respond to parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a shortage at a wage of $13, calculates the shortage as 45 bakers, and shows the work.

$$\text{Shortage} = \text{Quantity Demanded} - \text{Quantity Supplied} = 135 - 90 = 45$$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of workers as 90 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $13 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the quantity of output produced will increase and explains that as each worker's extra output (marginal product) increases, the firm's MRP increases, increasing the quantity of labor hired as well as the quantity of output produced by the firm.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should rent more capital and explains that the ratio of the marginal product of labor to the wage (2) is less than the ratio of the marginal product of capital to the rental price of capital (10), or the firm can get more output for their money by renting more capital, or

$$\frac{MP_{Labor}}{P_{Labor}} < \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{16}{8} < \frac{50}{5}$$

$$2 < 10$$

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Bob's Barber Shop.

Number of Barbers	Total Product per Hour
1	3
2	7
3	12
4	16
5	19
6	21
7	22
8	20

(a) After which barber do diminishing marginal returns begin for Bob's Barber Shop? Explain using numbers.

(b) Assume Bob's Barber Shop sells haircut services in a perfectly competitive market at a unit price of $9. Calculate the marginal revenue product of the sixth barber. Show your work.

(c) Bob's Barber Shop hires barbers in a perfectly competitive labor market for barbers at a wage rate of $25 per hour, and the market price of haircut services remains $9. How many barbers will Bob's Barber Shop hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is an increase in the demand for haircut services in the market. What will happen to each of the following?
(i) The market wage rate. Explain.
(ii) The marginal revenue product curve for Bob's Barber Shop. Explain.

4. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin after the third worker and explains that the marginal product (MP) of the fourth worker (4) is less than the MP of the third worker (5).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the sixth worker as $18 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$9 \times 2 = \$18$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 5 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 5^{th} worker ($27) is greater than the marginal resource cost (MRC) or wage ($25), but the MRP of the 6^{th} worker ($18) is less than the MRC ($25).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the market wage will increase and explains that an increase in the market demand for haircut services will lead to an increase in demand for barbers because the demand for barbers is dependent on (or derived from) the demand for haircut services.

k

· States that the marginal revenue product curve for the firm will shift to the right and explains that the marginal revenue product is the price of the service times the marginal product, so an increase in the demand for haircut services will increase the market price of haircut services and will therefore increase the marginal revenue product for every unit of labor.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Camila's Convenience Store.

Number of Clerks	Total Product per Hour
1	5
2	13
3	23
4	35
5	50
6	62
7	72
8	76

(a) After which clerk do diminishing marginal returns begin for Camila's Convenience Store? Explain using numbers.

(b) Assume Camila's Convenience Store sells its retail goods in a perfectly competitive market at a price of $5. Calculate the marginal revenue product of the fifth clerk. Show your work.

(c) Camila's Convenience Store hires clerks in a perfectly competitive labor market for clerks at a market wage of $24 per hour, and the market price of services remains $5. How many clerks will Camila's Convenience Store hire to maximize its profit? Explain using marginal analysis.

(d) Assume the market price of retail goods decreases as a result of a decrease in the number of consumers and Camila's Convenience Store continues to operate. What will happen to each of the following?
(i) The marginal factor cost for Camila's Convenience Store. Explain.
(ii) The marginal revenue product curve for Camila's Convenience Store. Explain.

5. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

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k

0	1 ✓

The response states that diminishing marginal returns begin after the fifth worker and explains that the marginal product (MP) of the sixth worker (12) was less than the MP of the fifth worker (15).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fifth worker as $75 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$5 \times 15 = \$75$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 7 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 7th worker ($50) is greater than the marginal resource cost (MRC) or wage ($24), but the MRP of the 8th worker ($20) is less than the MRC ($24).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the marginal factor cost for the firm will decrease and explains that a decrease in the price of retail goods will lead to a decrease in demand for workers in that market, which will decrease the market wage and therefore decrease the firm's marginal factor cost because the firm is a wage taker.

k

· States that the marginal revenue product curve for the firm will shift to the left and explains that the marginal revenue product is the price of the product times the marginal product, so a decrease in the market price of retail goods will decrease the marginal revenue product for every unit of labor.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Briana's Brick Shop.

Number of Brick Masons	Total Product per Hour
1	9
2	19
3	30
4	42
5	52
6	61
7	63
8	60

(a) After which brick mason do diminishing marginal returns begin for Briana's Brick Shop? Explain using numbers.

(b) Assume Briana's Brick Shop sells its bricks in a perfectly competitive market at a price of $6. Calculate the marginal revenue product of the seventh brick mason. Show your work.

(c) Briana's Brick Shop hires brick masons in a perfectly competitive labor market for brick masons at a wage rate of $48 per hour, and the market price of bricks remains $6. How many brick masons will Briana's Brick Shop hire to maximize its profit? Explain using marginal analysis.

(d) Assume brick masons and machines are substitutes in the production of bricks by all brick-making firms in the market. If machines, a fixed input, become more expensive and Briana's Brick Shop produces the same quantity of bricks, will each of the following increase, decrease, or stay the same?
(i) The wage rate Briana's Brick Shop will pay its brick masons. Explain.
(ii) The demand curve for brick masons for Briana's Brick Shop. Explain.

6. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

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k

0	1 ✓

The response states that diminishing marginal returns begin after the fourth worker and explains that the marginal product (MP) of the fifth worker (10) was less than the MP of the fourth worker (12).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the seventh worker as $12 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$6 \times 2 = \$12$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 6 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 6th worker ($54) is greater than the marginal resource cost (MRC) or wage ($48), but the MRP of the 7th worker ($12) is less than the MRC ($48).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the wage rate the firm will pay will increase and explains that an increase in the price of machines will result in an increase in the demand for workers because machines and workers are substitutes in producing bricks. An increase in the demand for workers will increase the market wage and therefore increase the wage rate paid by the firm because the firm is a wage taker.

k

· States that the demand curve for brick masons by Briana's Brick Shop will stay the same in the short run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP), which is the price of the product times the marginal product, and in the short run there is no change in the price of the product or the marginal product.

Or states that the demand curve for brick masons by Briana's Brick Shop will increase in the long run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP) which is the price of the product times the marginal product, and an increase in the price of an input will decrease the supply of bricks in the market, which will increase the market price of bricks, and therefore will increase the marginal revenue product for every unit of labor.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Phyliss's Carpentry Contractors.

Number of Carpenters	Total Product per Hour
1	200
2	255
3	305
4	345
5	380
6	410
7	435
8	455

(a) Beginning with which carpenter do diminishing marginal returns set in for Phyliss's Carpentry Contractors? Explain using numbers.

(b) Assume Phyliss's Carpentry Contractors sells its carpentry services in a perfectly competitive market at a price of $2. Calculate the marginal revenue product of the fifth carpenter. Show your work.

(c) Phyliss's Carpentry Contractors hires carpenters in a perfectly competitive labor market for carpenters at a wage rate of $90 per hour, and the market price of services remains $2. How many carpenters will Phyliss's Carpentry Contractors hire to maximize its profit? Explain using marginal analysis.

(d) Assume carpenters must pay for a certification exam before they can work in this industry. If the cost of that exam decreases, what will happen to each of the following in equilibrium?
(i) The market wage rate. Explain.
(ii) The number of workers hired in the labor market. Explain.

k

7. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that diminishing marginal returns begin with the second worker and explains that the marginal product (MP) of the second worker (55) is less than the MP of the first worker (200).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fifth worker as \$70 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$2 \times 35 = \$70$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 3 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 3rd worker (\$100) is greater than the marginal resource cost (MRC) or wage (\$90), but the MRP of the 4th worker (\$80) is less than the MRC (\$90).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

k

The response does both of the following:

· States that the market wage rate will decrease and explains that a decrease in the cost of the exam will lead to an increase in the supply of workers in that market.

· States that the number of workers hired in the labor market will increase and explains that the decrease in the wage rate resulting from the increase in the supply of workers in that market will lead to more workers hired given the downward-sloping demand curve.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Chukwuma's Salon.

Number of Stylists	Total Product per Hour
1	6
2	13
3	21
4	30
5	40
6	47
7	50
8	51

(a) After which stylist do diminishing marginal returns begin for Chukwuma's Salon? Explain using numbers.

(b) Assume Chukwuma's Salon sells its hair styling services in a perfectly competitive market at a price of $6. Calculate the marginal revenue product of the third stylist. Show your work.

(c) Chukwuma's Salon hires stylists in a perfectly competitive labor market for stylists at a wage rate of $35 per hour, and the market price of services remains $6. How many stylists will Chukwuma's Salon hire to maximize its profit? Explain using marginal analysis.

(d) Assume the market price of hair styling services increases as a result of an increase in the number of customers. What will happen to each of the following?
(i) The marginal factor cost for Chukwuma's Salon. Explain.
(ii) The marginal revenue product curve for Chukwuma's Salon. Explain.

k

8. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that diminishing marginal returns begin after the fifth worker and explains that the marginal product (MP) of the sixth worker (7) was less than the MP of the fifth worker (10).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the third worker as $48 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$6 \times 8 = \$48$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 6 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 6th worker ($42) is greater than the marginal resource cost (MRC) or wage ($35), but the MRP of the 7th worker ($18) is less than the MRC ($35).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

k

The response does both of the following:

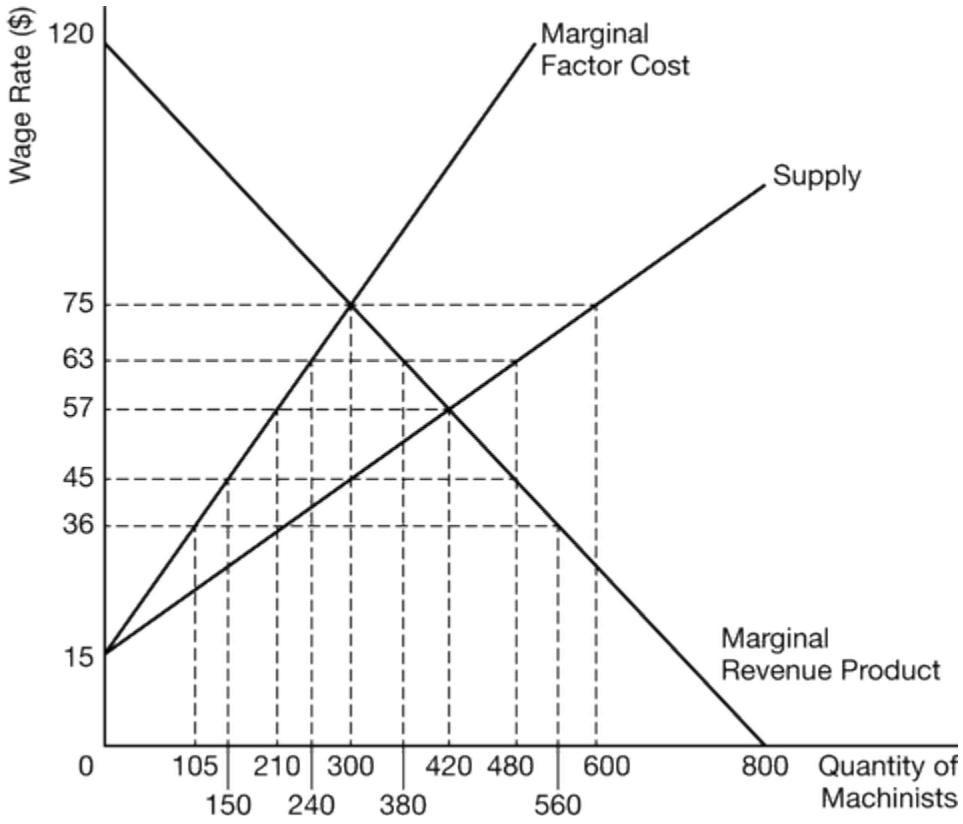
· States that the marginal factor cost for the firm will increase and explains that an increase in the price of hair styling services will lead to an increase in demand for workers in that market, which will increase the market wage and therefore increase the firm's marginal factor cost because the firm is a wage taker.

· States that the marginal revenue product curve for the firm will shift to the right and explains that the marginal revenue product is the price of the product times the marginal product, so an increase in the price of hair styling services will increase the marginal revenue product for every unit of labor.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Central Manufacturing Company is the only manufacturing facility in a small remote town, and Central Manufacturing Company is the only employer of machinists in the area. The graph below shows the market for machinists with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) If the wage rate is $63, state whether there will be a shortage or a surplus of machinists and calculate its size. Show your work.

(b) Identify the profit-maximizing number of machinists. Explain using the labeling on the graph.

(c) Identify the profit-maximizing wage rate that Central Manufacturing Company will pay its machinists. Explain using the labeling on the graph.

(d) If the marginal product of machinists increases, what will happen to the quantity of output produced by Central Manufacturing Company? Explain.

(e) Assume instead that Central Manufacturing Company uses both labor and capital in producing widgets. The marginal product of the last unit of labor hired is 120 widgets per day and the marginal product of the last unit of capital rented is

k

150 widgets per day; the daily wage rate for labor is $40 and the daily rental price for capital is $30. To minimize the cost of producing its current level of output, should Central Manufacturing Company rent more capital, less capital, or the same amount of capital? Explain using marginal analysis.

9. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a surplus at a wage of $63, calculates the surplus as 100 workers, and shows the work.

$$\text{Surplus} = \text{Quantity Supplied} - \text{Quantity Demanded} = 480 - 380 = 100$$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of workers as 300 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $45 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the quantity of output produced will increase and explains that as each worker's extra output (marginal product) increases, the firm's MRP increases, increasing the quantity of labor hired as well as the quantity of output produced by the firm.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should rent more capital and explains that the ratio of the marginal product of labor to the wage (3) is less than the ratio of the marginal product of capital to the rental price of capital (5), or the firm can get more output for their money by renting more capital, or

$$\frac{MP_{Labor}}{P_{Labor}} < \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{120}{40} < \frac{150}{30}$$

$$3 < 5$$

k

CleanIt is a perfectly competitive, profit-maximizing trash collection firm. CleanIt hires workers in a perfectly competitive labor market.

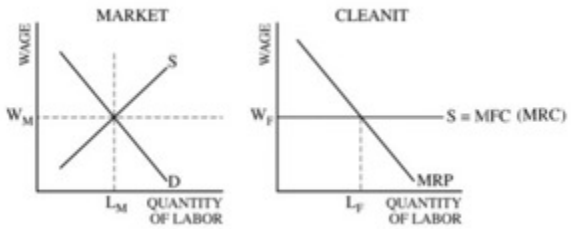
a. Draw side-by-side graphs for the labor market and for CleanIt and show each of the following.
    i. The market wage, labeled W_M, and the quantity of workers hired in the market, labeled L_M
    ii. The marginal factor (resource) cost curve, labeled MFC
    iii. The marginal revenue product curve, labeled MRP
    iv. The wage paid by the firm, labeled W_F, and the quantity of workers hired by the firm, labeled L_F

b. Assume that CleanIt is the only firm in the industry to adopt a new technology. The new technology increases the productivity of CleanIt's workers.
    i. In the short run, will the wage paid by CleanIt be higher than, lower than, or equal to W_F? Explain.
    ii. In the short run, will the number of workers hired by CleanIt increase, decrease, or stay the same? Explain.

c. CleanIt uses capital in the form of trucks, which it rents for $10,000 each. The marginal product of the last truck used is 100,000 units. If CleanIt is minimizing its costs and the marginal product of the last worker hired is 500 units, calculate the wage. Show your work.

10. Respond to all parts of the question.

Part A



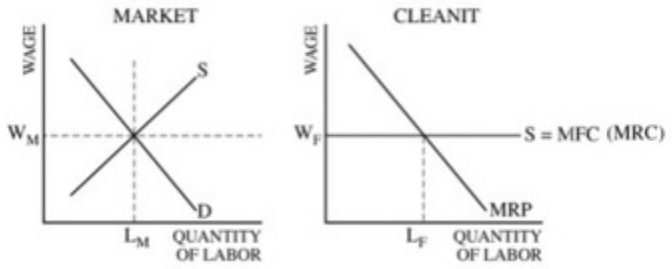
3 Points

- One point is earned for drawing a correctly labeled graph of the labor market with a upward-sloping labor supply curve and a downward-sloping labor demand curve, and for showing the equilibrium wage, WM, and the equilibrium quantity, LM.
- One point is earned for drawing a correctly labeled graph for CleanIt showing a downward marginal revenue product curve, MRP, and a horizontal labor supply curve, labeled MFC(MRC).
- One point is earned for showing the equilibrium wage, labeled WF equal to WM and MFC(MRC), and the equilibrium quantity of workers hired, labeled LF.

k

0	1	2	3 ✓

The student earns all of the following points:



- One point is earned for drawing a correctly labeled graph of the labor market with a upward-sloping labor supply curve and a downward-sloping labor demand curve, and for showing the equilibrium wage, WM, and the equilibrium quantity, LM.
- One point is earned for drawing a correctly labeled graph for CleanIt showing a downward marginal revenue product curve, MRP, and a horizontal labor supply curve, labeled MFC(MRC).
- One point is earned for showing the equilibrium wage, labeled WF equal to WM and MFC(MRC), and the equilibrium quantity of workers hired, labeled LF.

Part B

2 Points

- One point is earned for stating that wage paid by CleanIt will be equal to WF because the firm is a wage taker; **or** because there is no change in WM; **or** because MFC (MRC) stays constant.
- One point is earned for stating that the number of workers hired by CleanIt will increase because the marginal product of labor increases **or** there is an increase in the MRP of workers, **or** the MRP curve shifts to the right.

0	1	2 ✓

The student earns all of the following points:

- One point is earned for stating that wage paid by CleanIt will be equal to WF because the firm is a wage taker; **or** because there is no change in WM; **or** because MFC (MRC) stays constant.
- One point is earned for stating that the number of workers hired by CleanIt will increase because the marginal product of labor increases **or** there is an increase in the MRP of workers, **or** the MRP curve shifts to the right.

k

Part C

One point is earned for correctly calculating the wage and for showing the work.

(100,000/ $10,000) = (500/W) W=$50 OR ($10,000/ 100,000) = (W/500) W=$50 OR (500/ 100,000) = (W/$10,000) W=$50

0	1 ✓

The student earns all of the following points:

One point is earned for correctly calculating the wage and for showing the work.

(100,000/ $10,000) = (500/W) W=$50 OR ($10,000/ 100,000) = (W/500) W=$50 OR (500/ 100,000) = (W/$10,000) W=$50

Coldbox Corporation hires its workers in a perfectly competitive labor market and produces and sells frozen peas in a perfectly competitive product market. The market price for frozen peas is $4 per bag. The table below shows Coldbox' short-run production of frozen peas. Labor is the only variable input. Coldbox Corporation's fixed cost is $500.

Number of Workers	Bags of Frozen Peas
0	0
1	60
2	140
3	250
4	320
5	380
6	400

a. When Coldbox hires the second worker, does it experience diminishing returns? Explain.

b. Calculate the average fixed cost if Coldbox hires 3 workers. Show your work.

c. If the wage is $200 per worker, identify the profit-maximizing number of workers for Coldbox. Explain using marginal analysis.

d. If the price of frozen peas decreases by $2 per bag, would the number of workers hired by Coldbox be more than, less than, or equal to the number of workers you identified in part (c) ? Explain.

e. Suppose that Coldbox hires workers from a monopsonistic labor market. Would the wage be higher, lower, or equal to the equilibrium wage in a perfectly competitive labor mark*et?*

k

11. Respond to all parts of the question.

Part A

One point is earned for stating that diminishing returns does not set in with the second worker because the marginal product, MP, is increasing (MP of the first worker is 60 and the MP of the second worker is 80).

0	1 ✓

The student earns all of the following points:

One point is earned for stating that diminishing returns does not set in with the second worker because the marginal product, MP, is increasing (MP of the first worker is 60 and the MP of the second worker is 80).

Part B

One point is earned for calculating the AFC = \$500 ÷ 250 = \$2.

0	1 ✓

The student earns all of the following points:

One point is earned for calculating the AFC = \$500 ÷ 250 = \$2.

Part C

One point is earned for stating that the profit-maximizing number of workers is 5. The MRP of the fifth worker is \$240 > the wage rate \$200. For the sixth worker, the MRP is \$80 < the wage rate of \$200.

0	1 ✓

The student earns all of the following points:

One point is earned for stating that the profit-maximizing number of workers is 5. The MRP of the fifth worker is \$240 > the wage rate \$200. For the sixth worker, the MRP is \$80 < the wage rate of \$200.

Part D

One point is earned for stating that the number of workers hired will be less than the number of workers in part (c), because the decrease in the price of peas decreases the marginal revenue product of labor (MRP).

k

0	1 ✓

The student earns all of the following points:

One point is earned for stating that the number of workers hired will be less than the number of workers in part (c), because the decrease in the price of peas decreases the marginal revenue product of labor (MRP).

Part E

One point is earned for stating that the wage will be lower.

0	1 ✓

The student earns all of the following points:

One point is earned for stating that the wage will be lower.

Assume that Company XYZ is a profit-maximizing firm that hires its labor in a perfectly competitive labor market and sells its product in a perfectly competitive output market.

a. Define the marginal revenue product of labor (MRP_L).

b. Using correctly labeled side-by-side graphs, show each of the following.

   i. The equilibrium wage in the labor market

   ii. The labor supply curve the firm faces

   iii. The number of workers the firm will hire

c. Company XYZ develops a new technology that increases its labor productivity. Currently this technology is not available to any other firm. For Company XYZ, explain how the increased productivity will affect each of the following.

   i. Wage rates

   ii. *Number of workers hired*

12. Respond to all parts of the question.

---

k

Part A

Part a: The marginal revenue product of labor is the change in total revenue associated with the change in output following a unit change in the employment of labor.

MRP of labor = MR (or P of output) x MPP of labor.

1 point - definition: the additional revenue from hiring an additional worker or

MRP=MP x MR or MRP=MP x P

0	1 ✓

Student receives 1/1 point(s)

Part a: The marginal revenue product of labor is the change in total revenue associated with the change in output following a unit change in the employment of labor.

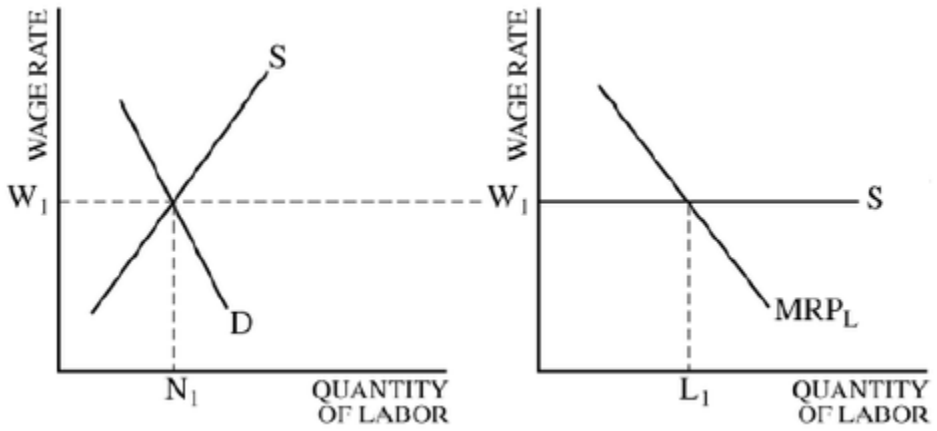
MRP of labor = MR (or P of output) x MPP of labor.

1 point - definition: the additional revenue from hiring an additional worker or

MRP=MP x MR or MRP=MP x P

Part B

Part b: The perfectly competitive labor market will have a downward-sloping labor demand curve and an upward-sloping labor supply curve. There will be an equilibrium wage and quantity of labor. The firm will be a wage taker and have a perfectly elastic labor supply at the market wage rate. The firm's labor demand curve is its marginal revenue product of labor curve. Thus, the profit-maximizing firm will hire the amount of labor associated with the intersection of its marginal revenue product of labor curve and its horizontal labor supply curve. The firm will pay each unit of labor the market wage.



k

1 point for the correctly labeled labor market graph showing equilibrium wage.

1 point for the firm graph indicating a downward-sloping demand (MRPL) curve.

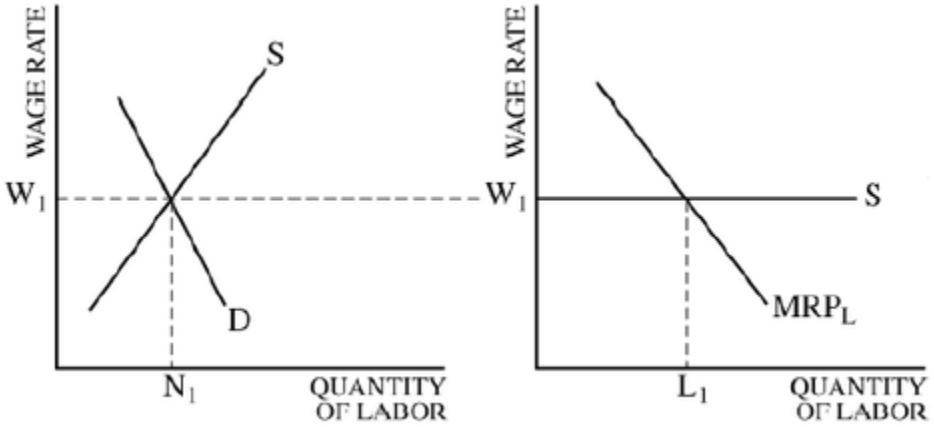
1 point for the horizontal labor supply curve for the firm.

1 point for showing quantity of labor for the firm at the intersection of labor

supply and labor demand.

0	1	2	3	4 ✓

Student receives 4/4 point(s)



1 point for the correctly labeled labor market graph showing equilibrium wage.

1 point for the firm graph indicating a downward-sloping demand (MRPL) curve.

1 point for the horizontal labor supply curve for the firm.

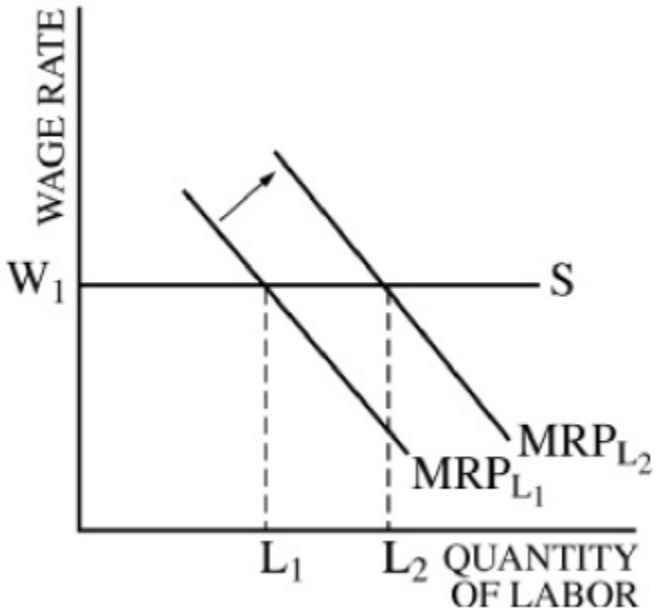
1 point for showing quantity of labor for the firm at the intersection of labor

supply and labor demand.

Part C

Part c: With an increase in labor productivity that affects only Company XYZ there will be no perceptible change in labor market. The equilibrium wage stays the same. Company XYZ will have an outward shift in its marginal revenue product of labor (or labor demand) curve, leading to more employment at the unchanged market wage.

k

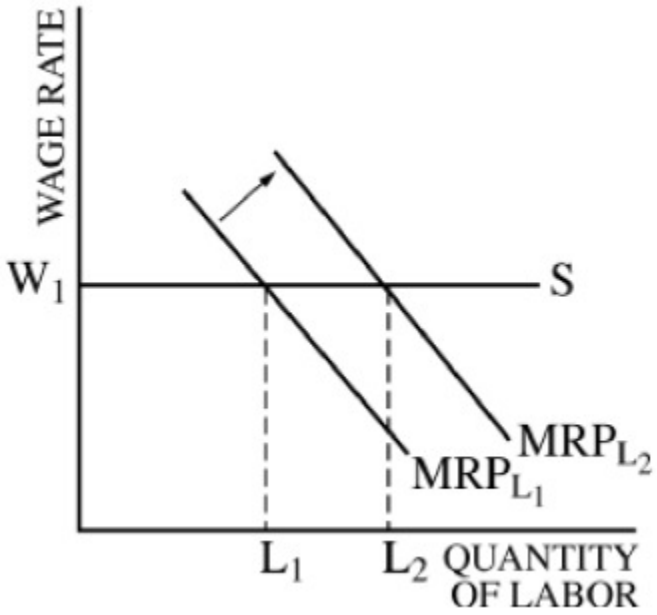


1 point - wage rate for the firm remains constant at the original wage.

1 point - the number of worker hired by XYZ increases because XYZ's MRP increases or labor demand curve shifts out.

0	1	2 ✓

Student receives 2/2 point(s)

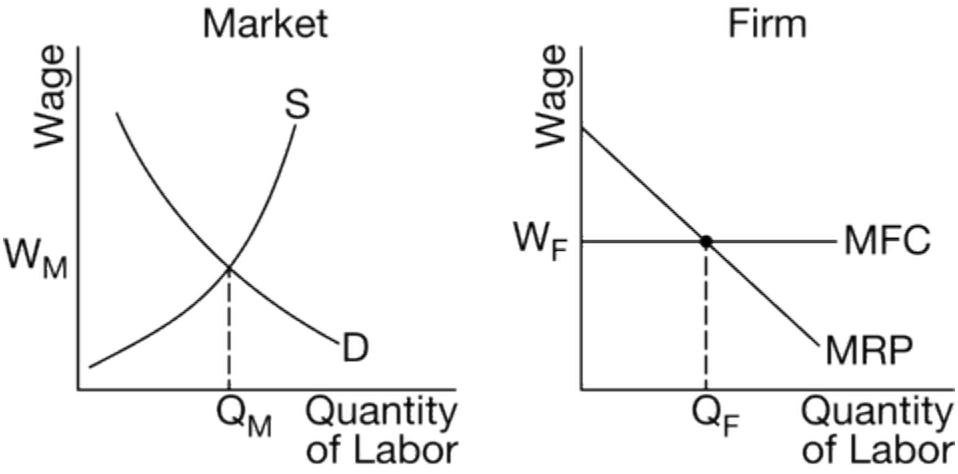


k

1 point - wage rate for the firm remains constant at the original wage.

1 point - the number of worker hired by XYZ increases because XYZ's MRP increases or labor demand curve shifts out.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.



The graph above shows a labor market and a typical individual firm that is hiring labor from that market.

(a) If $W_M = W_F$, from what type of labor market does the firm hire its workers?

(b) Assume the productivity of workers increases as a result of improvement in technology. What will happen to each of the following in the short run?

(i) The market demand for labor

(ii) The wage rate the firm will pay. Explain.

(c) Suppose the firm only produces good X and that the price of good Y, a substitute good, decreases. What will happen to the optimal quantity of labor the firm will hire? Explain.

(d) If the labor market were a monopsony, would the monopsonist hire more, fewer, or the same number of workers as Q_M to maximize its profit?

13. Respond to all parts of the question.

Part (a)

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

---

k

0	1 ✓

The response states that the firm hires workers in a perfectly competitive labor market.

Part (b)

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

The response to part (b)(ii) must both state that the wage rate the firm will pay will increase and explain why in order to receive the point.

0	1	2 ✓

The response accurately includes both of the criteria below.

- ☐ States that the demand for labor will increase
- ☐ States that the wage rate the firm will pay will increase and explains that the increase in the market demand for labor will increase the market wage, which increases the wage rate paid by the firm because the firm is a wage taker

Part (c)

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

The response must both state that the firm will hire fewer workers and explain why in order to receive the point.

0	1 ✓

The response states that the firm will hire fewer workers and explains that the price of the firm's product will decrease, which will therefore reduce the derived demand for labor.

Part (d)

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

k

The response states that if the labor market was a monopsony, the firm would hire fewer workers than Q_M to maximize profits.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Kayla's Construction Firm.

Number of Construction Workers	Total Product per Hour
1	110
2	230
3	360
4	400
5	435
6	465
7	490
8	495

(a) Beginning with which construction worker do diminishing marginal returns set in for Kayla's Construction Firm? Explain using numbers.

(b) Assume Kayla's Construction Firm sells its services in a perfectly competitive market at a price of $3. Calculate the marginal revenue product of the fourth construction worker. Show your work.

(c)Kayla's Construction Firm hires construction workers in a perfectly competitive labor market for construction workers at a wage rate of $110 per hour, and the market price of services remains $3. How many construction workers will Kayla's Construction Firm hire to maximize its profit? Explain using marginal analysis.

(d) Assume construction workers must pay for a certification exam before they can work in this industry. If the cost of that exam increases, what will happen to each of the following in equilibrium?
(i) The market wage rate. Explain.
(ii) The number of workers hired in the labor market. Explain.

14. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

---

k

0	1 ✓

The response states that diminishing marginal returns begin with the fourth worker and explains that the marginal product (MP) of the fourth worker (40) is less than the MP of the third worker (130).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fourth worker as $120 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$3 \times 40 = \$120$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 4 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 4^{th} worker ($120) is greater than the marginal resource cost (MRC) or wage ($110), but the MRP of the 5th worker ($105) is less than the MRC ($110).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the market wage rate will increase and explains that an increase in the cost of the exam will lead to a decrease in the supply of workers in that market.

· States that the number of workers hired in the labor market will decrease and explains that the increase in the wage rate

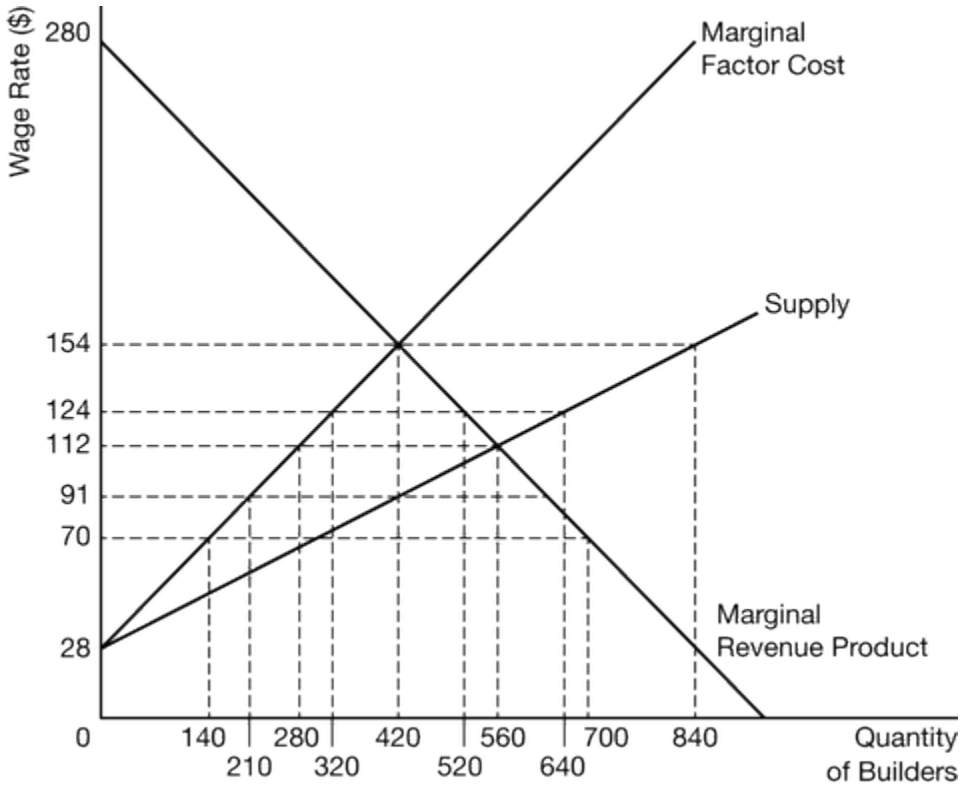
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resulting from the decrease in the supply of workers in that market will lead to fewer workers hired given the downward-sloping demand curve.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Cornel's Construction is the only builder in a small remote town, and Cornel's Construction is the only employer of builders in the area. The graph below shows the market for builders with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) If the wage rate is $124, state whether there will be a shortage or a surplus of builders and calculate its size. Show your work.

(b) Identify the profit-maximizing number of builders that Cornel's Construction will hire. Explain using the labeling on the graph.

(c) Identify the profit-maximizing wage rate that Cornel's Construction will pay its builders. Explain using the labeling on the graph.

(d) If the marginal product of builders increases, what will happen to the quantity of services provided by Cornel's Construction? Explain.

(e) Assume instead that Cornel's Construction uses both labor and capital in providing its services. The marginal product of the last unit of labor hired is 15 projects per hour and the marginal product of the last unit of capital rented is 10 projects per hour; the hourly wage rate for labor is $150 and the hourly rental price for capital is $50. To minimize the

k

cost of providing its current level of output, should Cornel's Construction rent more capital, less capital, or the same amount of capital? Explain using marginal analysis.

15. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a surplus at a wage of $124, calculates the surplus as 120 workers, and shows the work.

$$\text{Surplus} = \text{Quantity Supplied} - \text{Quantity Demanded} = 640 - 520 = 120$$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of workers as 420 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $91 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the quantity of services provided will increase and explains that as each worker's extra output (marginal product) increases, the firm's MRP increases, increasing the quantity of labor hired as well as the quantity of output produced by the firm.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should rent more capital and explains that the ratio of the marginal product of labor to the wage (0.1) is less than the ratio of the marginal product of capital to the rental price of capital (0.2), or the firm can get more output for their money by renting more capital, or

$$\frac{MP_{Labor}}{P_{Labor}} < \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{15}{150} < \frac{10}{50}$$

$$0.1 < 0.2$$

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Denice's Diner.

Number of Cooks	Total Product per Hour
1	6
2	13
3	22
4	30
5	36
6	40
7	42
8	41

(a) Beginning with which cook do diminishing marginal returns set in for Denice's Diner? Explain using numbers.

(b) Assume Denice's Diner sells its meals in a perfectly competitive market at a unit price of $8. Calculate the marginal revenue product of the sixth cook. Show your work.

(c) Denice's Diner hires cooks in a perfectly competitive labor market for cooks at a wage rate of $15 per hour, and the market price of meals remains $8. How many cooks will Denice's Diner hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is an increase in the productivity of all workers in the labor market for cooks. What will happen to each of the following in equilibrium?
(i) The number of workers hired in the labor market for cooks. Explain.
(ii) The wage rate Denice's Diner will pay its cooks. Explain.

16. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

k

The response states that diminishing marginal returns begin with the fourth worker and explains that the marginal product (MP) of the fourth worker (8) was less than the MP of the third worker (9).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the sixth worker as $32 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$8 \times 4 = \$32$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 7 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 7th worker ($16) is greater than the marginal resource cost (MRC) or wage ($15), but the MRP of the 8th worker ($-\$8$) is less than the MRC ($15).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the number of workers hired in the labor market will increase and explains that an increase in the productivity of workers will increase the demand for labor in the market for cooks.

· States that the wage rate Denice's Diner will pay will increase and explains that the increase in the market demand for labor will increase the market wage, which increases the wage rate paid by the firm because the firm is a wage taker.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Esther's Travel Agency.

Number of Travel Agents	Total Product per Hour
1	22
2	55
3	85
4	110
5	130
6	140
7	145
8	135

(a) After which travel agent do diminishing marginal returns begin for Esther's Travel Agency? Explain using numbers.

(b) Assume Esther's Travel Agency sells its travel services in a perfectly competitive market at a unit price of $5. Calculate the marginal revenue product of the fourth travel agent. Show your work.

(c) Esther's Travel Agency hires travel agents in a perfectly competitive labor market for travel agents at a wage rate of $26 per hour, and the market price of travel services remains $5. How many travel agents will Esther's Travel Agency hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is a decrease in the demand for travel services in the market and Esther's Travel Agency continues to operate. What will happen to each of the following?
(i) The market wage rate. Explain.
(ii) The marginal revenue product curve for Esther's Travel Agency. Explain.

17. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin after the second worker and explains that the marginal product (MP) of the third worker (30) is less than the MP of the second worker (33).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fourth worker as $125 and shows the work.

$$MRP = P \times MP = \$5 \times 25 = \$125$$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 6 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 6^{th} worker ($50) is greater than the marginal resource cost (MRC) or wage ($26), but the MRP of the 7^{th} worker ($25) is less than the MRC ($26).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

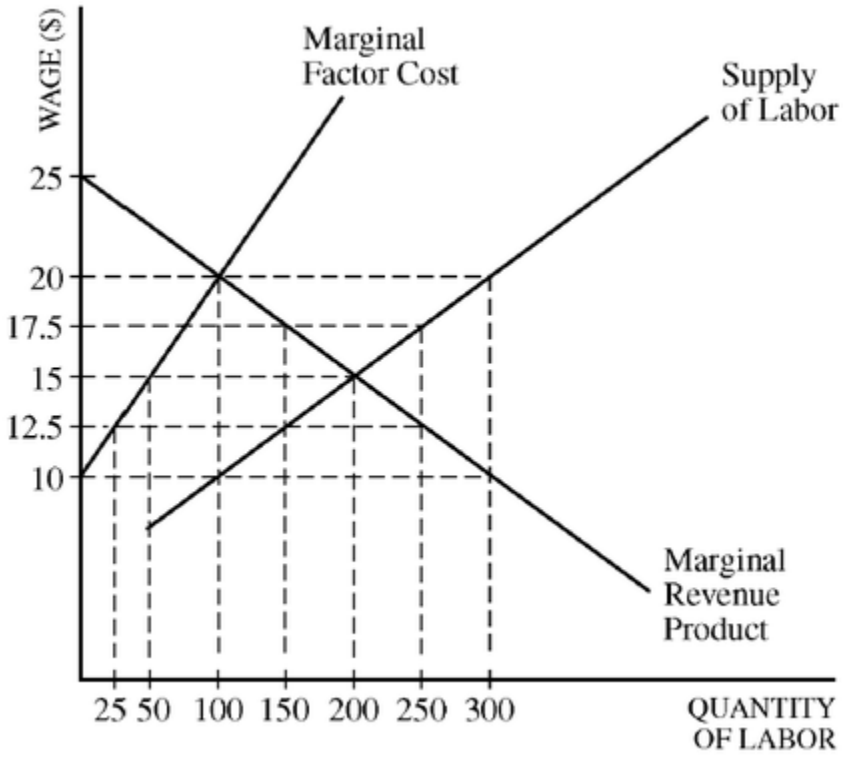
0	1	2 ✓

The response does both of the following:

· States that the market wage will decrease and explains that a decrease in the market demand for travel services will lead to a decrease in demand for travel agents because the demand for travel agents is dependent on (or derived from) the demand for travel services.

k

· States that the marginal revenue product curve for the firm will shift to the left and explains that the marginal revenue product is the price of the service times the marginal product, so a decrease in the demand for travel services will decrease the price of travel services and will therefore decrease the marginal revenue product for every unit of labor.



Woodland is a small town in which everyone works for TreeMart, the local lumber company. TreeMart is a monopsonist in the labor market and a perfect competitor in the lumber market. In the short run, labor is the only variable input. The labor market for TreeMart is given in the graph above.

a. Identify the profit-maximizing quantity of labor for TreeMart.

b. Identify the wage rate TreeMart pays to hire the profit-maximizing quantity of labor.

c. Identify the quantity of labor hired in each of the following situations.

   i. TreeMart operates in a competitive labor market.

   ii. The government imposes a minimum wage of $12.5. Explain.

18. Respond to all parts of the question.

Part A

1 point:

---

k

- One point is earned for identifying the profit-maximizing quantity of labor as 100 units.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for identifying the profit-maximizing quantity of labor as 100 units.

Part B

1 point:

- One point is earned for identifying the wage rate TreeMart pays as $10.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for identifying the wage rate TreeMart pays as $10.

Part C

3 points:

- One point is earned for identifying the quantity of labor in a competitive labor market as 200 units.
- One point is earned for identifying the quantity of labor, 150 units, given a minimum wage of $12.5.
- One point is earned for explaining that the MFC curve (or the supply curve for labor) becomes horizontal at the minimum wage up to a quantity of 150.

0	1	2	3 ✓

Student receives 3/3 point(s)

3 points:

- One point is earned for identifying the quantity of labor in a competitive labor market as 200 units.

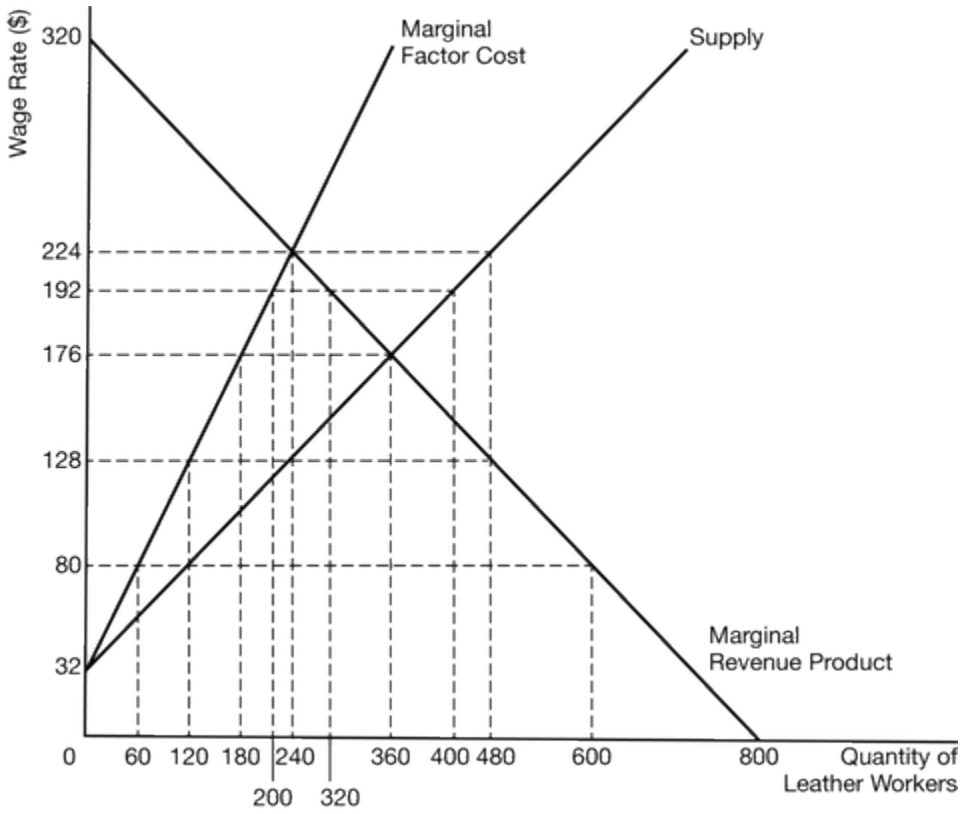
k

- One point is earned for identifying the quantity of labor, 150 units, given a minimum wage of $12.5.
- One point is earned for explaining that the MFC curve (or the supply curve for labor) becomes horizontal at the minimum wage up to a quantity of 150.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Henri's Handbags is the only leather bags shop in a small remote town, and Henri's Handbags is the only employer of leather workers in the area. The graph below shows the market for leather workers with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) If the wage rate is $192, state whether there will be a shortage or a surplus of leather workers and calculate its size. Show your work.

(b) Identify the profit-maximizing number of leather workers that Henri's Handbags will hire. Explain using the labeling on the graph.

(c) Identify the profit-maximizing wage rate that Henri's Handbags will pay its leather workers. Explain using the labeling on the graph.

(d) Assume that the market for leather workers becomes perfectly competitive. What wage rate would Henri's Handbags pay its leather workers if it were a perfectly competitive firm? Explain using labeling on the graph.

(e) Assume instead that Henri's Handbags uses both labor and capital in its production of handbags. The marginal product of the last unit of labor hired is 180 handbags per hour and the marginal product of the last unit of capital rented is 160

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handbags per hour; the hourly wage rate for labor is $60 and the hourly rental price for capital is $20. To minimize the cost of producing its current level of output, should Henri's Handbags hire more leather workers, fewer leather workers, or the same number of leather workers? Explain using marginal analysis.

19. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a surplus at a wage of $192, calculates the surplus as 80 leather workers, and shows the work.

$$\text{Surplus} = \text{Quantity Supplied} - \text{Quantity Demanded} = 400 - 320 = 80$$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of workers as 240 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $128 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the perfectly competitive wage would be $176 and explains that the wage would be determined by the intersection of the supply curve and the marginal revenue product curve.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should hire fewer leather workers and explains that the ratio of the marginal product of labor to the wage (3) is less than the ratio of the marginal product of capital to the rental price of capital (8), or the firm can get more output for their money by hiring fewer workers, or

$$\frac{MP_{Labor}}{P_{Labor}} < \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{180}{60} < \frac{160}{20}$$

$$3 < 8$$

k

Number of Unskilled Workers Hired	Quantity of Radios Produced (per day)
0	0
1	20
2	45
3	60
4	70
5	75
6	79
7	80

Assume that HZRad Company produces clock radios as shown in the short-run production function in the table above. HZRad can sell all the clock radios it produces at a market price of $20 each and can hire all the unskilled labor it needs at a wage of $90 per day per worker. Assume also that labor is the only variable input.

a. Using the specific information above, draw a correctly labeled graph of HZRad's current supply curve for unskilled labor.

b. What is HZRad's profit-maximizing output level? Explain.

c. Suppose that HZRad is the first company to use a new technology that increases the productivity of its unskilled workers.

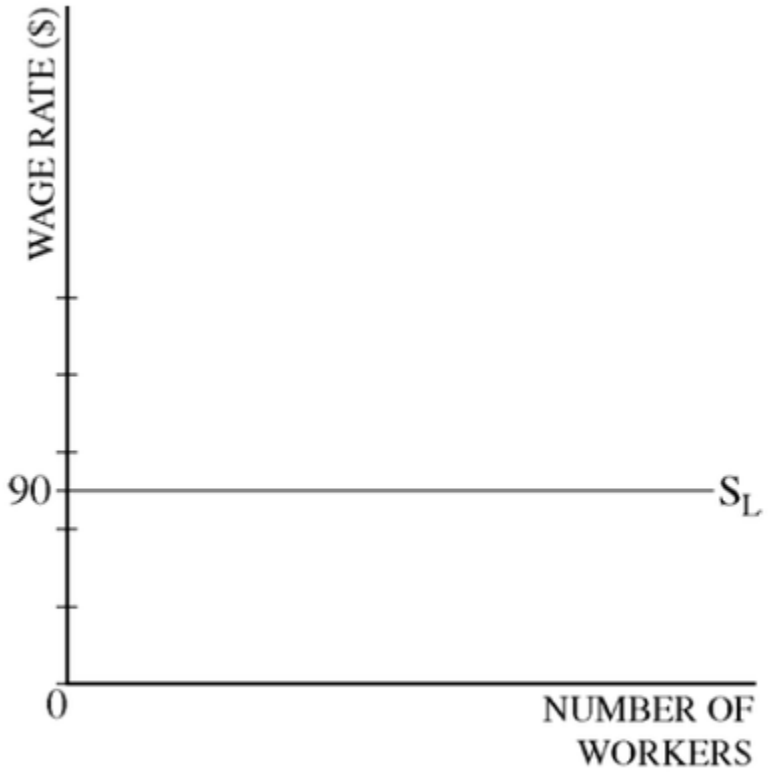
    i. How will the new technology affect the quantity of unskilled labor HZRad hires? Explain.

    ii. How will the new technology affect the wage paid to HZRad's unskilled workers?

20. Respond to all parts of the question.

Part A

k



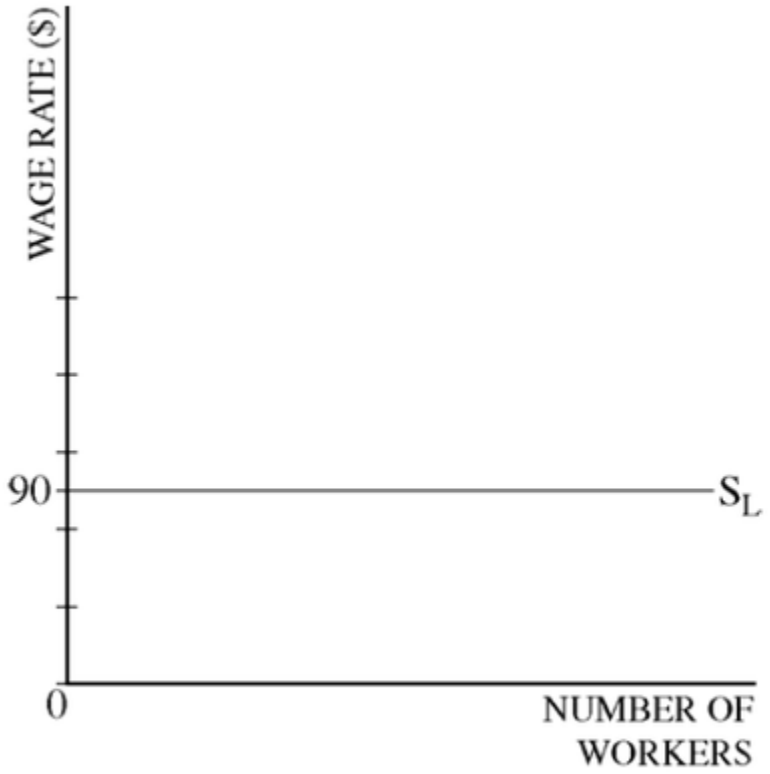
1 point:

- One point is earned for correctly labeled axes with a horizontal labor supply curve at $90.

0	1 ✓

Student receives 1/1 point(s)

k



1 point:

- One point is earned for correctly labeled axes with a horizontal labor supply curve at $90.

Part B

2 points:

- One point is earned for identifying the profit-maximizing output as 75, or between 75 and 79.
- One point is earned for stating that MRP is greater than $90 for the fifth worker, but less than $90 for the sixth worker.

0	1	2 ✓

Student receives 2/2 point(s)

2 points:

- One point is earned for identifying the profit-maximizing output as 75, or between 75 and 79.

k

- One point is earned for stating that MRP is greater than $90 for the fifth worker, but less than $90 for the sixth worker.

Part C

3 points:

- One point is earned for stating that the quantity of labor HZRad hires increases.
- One point is earned for the explanation that the marginal product of labor increases at each input level, or the marginal product of labor curve shifts to the right, or the demand curve for labor shifts to the right.
- One point is earned for stating that the wage rate will remain constant.

0	1	2	3 ✓

Student receives 3/3 point(s)

3 points:

- One point is earned for stating that the quantity of labor HZRad hires increases.
- One point is earned for the explanation that the marginal product of labor increases at each input level, or the marginal product of labor curve shifts to the right, or the demand curve for labor shifts to the right.
- One point is earned for stating that the wage rate will remain constant.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Jose's Tax Office.

Number of Administrative Assistants	Total Product per Hour
1	40
2	90
3	150
4	180
5	200
6	215
7	225
8	230

(a) After which administrative assistant do diminishing marginal returns begin for Jose's Tax Office? Explain using numbers.

(b) Assume Jose's Tax Office sells its tax advisory services in a perfectly competitive market at a unit price of $4. Calculate the marginal revenue product of the fifth administrative assistant. Show your work.

(c) Jose's Tax Office hires administrative assistants in a perfectly competitive labor market for administrative assistants at a wage rate of $90 per hour, and the market price of services remains $4. How many administrative assistants will Jose's Tax Office hire to maximize its profit? Explain using marginal analysis.

(d) Assume administrative assistants and office software are substitutes in providing tax advisory services by all tax firms in the market. If office software, a fixed input, becomes more expensive and Jose's Tax Office provides the same quantity of tax advisory services, will each of the following increase, decrease, or stay the same?
(i) The wage rate Jose's Tax Office will pay its administrative assistants. Explain.
(ii) The demand curve for administrative assistants for Jose's Tax Office. Explain.

21. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin after the third worker and explains that the marginal product (MP) of the fourth worker (30) was less than the MP of the third worker (60).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fifth worker as \$80 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$4 \times 20 = \$80$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 4 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 4^{th} worker (\$120) is greater than the marginal resource cost (MRC) or wage (\$90), but the MRP of the 5^{th} worker (\$80) is less than the MRC (\$90).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the wage rate the firm will pay will increase and explains that an increase in the price of office software will result in an increase in the demand for workers because office software and workers are substitutes in providing tax advisory services. An increase in the demand for workers will increase the market wage and therefore increase the wage rate paid by the firm because the firm is a wage taker.

k

· States that the demand curve for administrative assistants by Jose's Tax Office will stay the same in the short run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP), which is the price of the service times the marginal product, and in the short run there is no change in the price of the service or the marginal product.

Or states that the demand curve for administrative assistants by Jose's Tax Office will increase in the long run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP) which is the price of the product times the marginal product, and an increase in the price of an input will decrease the supply of tax advisory services in the market, which will increase the market price of services, and therefore will increase the marginal revenue product for every unit of labor.

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Josh's Consulting Firm.

Number of Consultants	Total Product per Hour
1	21
2	43
3	66
4	88
5	108
6	126
7	141
8	151

(a) After which consultant do diminishing marginal returns begin for Josh's Consulting Firm? Explain using numbers.

(b) Assume Josh's Consulting Firm sells its consulting services in a perfectly competitive market at a unit price of $2. Calculate the marginal revenue product of the fifth consultant. Show your work.

(c) Josh's Consulting Firm hires consultants in a perfectly competitive labor market for consultants at a wage rate of $41 per hour, and the market price of consulting services remains $2. How many consultants will Josh's Consulting Firm hire to maximize its profit? Explain using marginal analysis.

(d) Assume the market price of consulting services increases as a result of an increase in the number of consumers. What will happen to each of the following?
(i) The marginal factor cost for Josh's Consulting Firm. Explain.
(ii) The marginal revenue product curve for Josh's Consulting Firm. Explain.

---

k

22. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that diminishing marginal returns begin after the third worker and explains that the marginal product (MP) of the fourth worker (22) was less than the MP of the third worker (23).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fifth worker as \$40 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$2 \times 20 = \$40$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 4 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 4^{th} worker (\$44) is greater than the marginal resource cost (MRC) or wage (\$41), but the MRP of the 5^{th} worker (\$40) is less than the MRC (\$41).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

k

The response does both of the following:

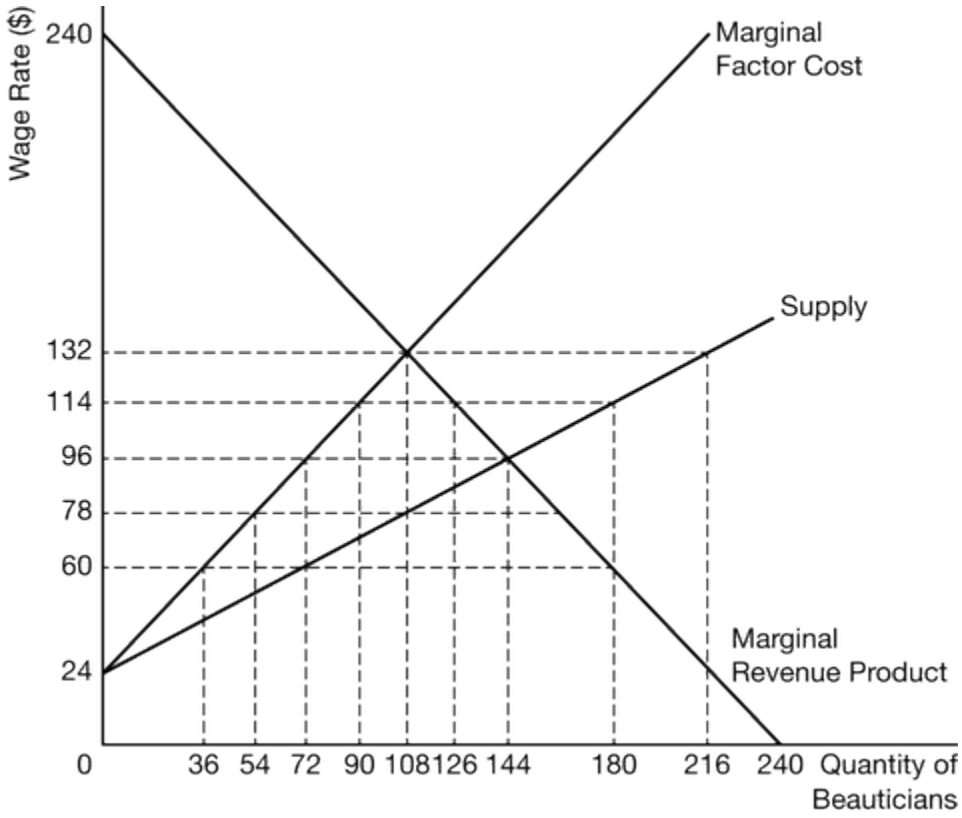
· States that the marginal factor cost for the firm will increase and explains that an increase in the price of consulting services will lead to an increase in demand for workers in that market, which will increase the market wage and therefore increase the firm's marginal factor cost because the firm is a wage taker.

· States that the marginal revenue product curve for the firm will shift to the right and explains that the marginal revenue product is the price of the product times the marginal product, so an increase in the price of consulting services will increase the marginal revenue product for every unit of labor.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Karen's Cuts is the only beauty salon in a small remote town, and Karen's Cuts is the only employer of beauticians in the area. The graph below shows the market for beauticians with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a Identify the profit-maximizing number of beauticians that Karen's Cuts will hire. Explain using the labeling on the graph.

(b) Identify the profit-maximizing wage rate that Karen's Cuts will pay its beauticians. Explain using the labeling on the graph.

(c) If the wage rate is $114, state whether there will be a shortage or a surplus of beauticians and calculate its size. Show your work.

(d) Assume that the market for beauticians becomes perfectly competitive. What wage rate would Karen's Cuts pay its beauticians if it were a perfectly competitive firm? Explain using labeling on the graph.

(e) Assume instead that Karen's Cuts uses both labor and capital in providing its services. The marginal product of the last unit of labor hired is 30 cuts per day and the marginal product of the last unit of capital rented is 20 cuts per day; the daily

k

wage rate for labor is $60 and the daily rental price for capital is $20. To minimize the cost of providing its current level of services, should Karen's Cuts hire more beauticians, fewer beauticians, or the same number of beauticians? Explain using marginal analysis.

23. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of beauticians as 108 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $78 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a surplus at a wage of $114, calculates the surplus as 54 beauticians, and shows the work.

$$\text{Surplus} = \text{Quantity Supplied} - \text{Quantity Demanded} = 180 - 126 \ = 54$$

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the perfectly competitive wage would be $96 and explains that the wage would be determined by the intersection of the supply curve and the marginal revenue product curve.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should hire fewer beauticians and explains that the ratio of the marginal product of labor to the wage (0.5) is less than the ratio of the marginal product of capital to the rental price of capital (1), or the firm can get more output for their money by hiring fewer workers, or

$$\frac{MP_{Labor}}{P_{Labor}} = \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{30}{60} > \frac{20}{20}$$

$$0.5 < 1$$

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Lakshmi's Law Office.

Number of Clerks	*Total Product per Hour*
1	*33*
2	*68*
3	95
4	120
5	140
6	155
7	165
8	160

(a) Beginning with which clerk do diminishing marginal returns set in for Lakshmi's Law Office? Explain using numbers.

(b) Assume Lakshmi's Law Office sells its legal services in a perfectly competitive market at a unit price of $4. Calculate the marginal revenue product of the sixth clerk. Show your work.

(c) Lakshmi's Law Office hires clerks in a perfectly competitive labor market for clerks at a wage of $130 per hour, and the market price of legal services remains $4. How many clerks will Lakshmi's Law Office hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is a decrease in the productivity of all workers in the labor market for clerks. What will happen to each of the following in equilibrium?
(i) The number of workers hired in the labor market for clerks. Explain.
(ii) The wage rate Lakshmi's Law Office will pay its clerks. Explain.

24. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

k

The response states that diminishing marginal returns begin with the third worker and explains that the marginal product (MP) of the third worker (27) is less than the MP of the second worker (35).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the sixth worker as $60 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$4 \times 15 = \$60$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 2 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 2nd worker ($140) is greater than the marginal resource cost (MRC) or wage ($130), but the MRP of the 3rd worker ($108) is less than the MRC ($130).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

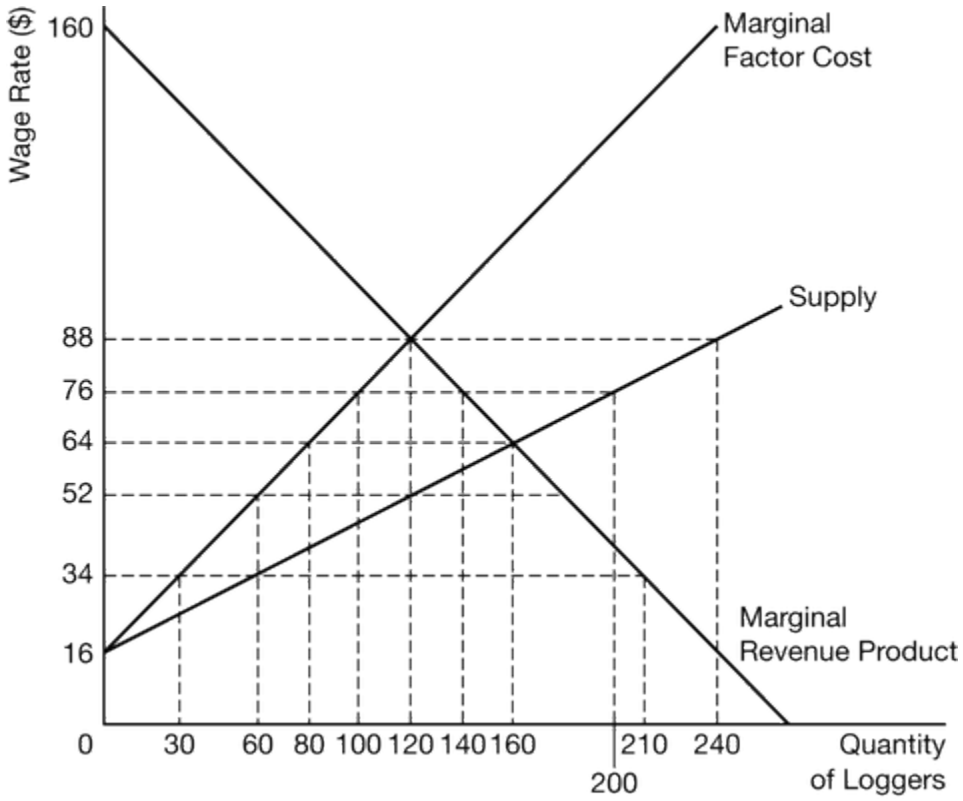
· States that the number of workers hired in the labor market would decrease and explains that a decrease in the productivity of workers will decrease the demand for labor in the market for clerks.

· States that the wage rate Lakshmi's Law Office will pay will decrease and explains that the decrease in the market demand for labor will decrease the market wage, which decreases the wage rate paid by the firm because the firm is a wage taker.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Larry's Logging is the only logging company in a small remote town, and Larry's Logging is the only employer of loggers in the area. The graph below shows the market for loggers with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) If the wage rate is $34, state whether there will be a shortage or a surplus of loggers and calculate its size. Show your work.

(b) Identify the profit-maximizing number of loggers that Larry's Logging will hire. Explain using the labeling on the graph.

(c) Identify the profit-maximizing wage rate that Larry's Logging will pay its loggers. Explain using the labeling on the graph.

(d) Assume that the market for loggers becomes perfectly competitive. What wage rate would Larry's Logging pay its loggers if it were a perfectly competitive firm? Explain using the labeling on the graph.

(e) Assume instead that Larry's Logging uses both labor and capital in its production of logs. The marginal product of the last unit of labor hired is 150 logs per hour and the marginal product of the last unit of capital rented is 200 logs per hour;

k

the hourly wage rate for labor is $30 and the hourly rental price for capital is $50. To minimize the cost of producing its current level of output, should Larry's Logging hire more loggers, fewer loggers, or the same number of loggers? Explain using marginal analysis.

25. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a shortage at a wage of $34, calculates the shortage as 150 loggers, and shows the work.

$$\text{Shortage} = \text{Quantity Demanded} - \text{Quantity Supplied} = 210 - 60 = 150$$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of loggers as 120 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing wage the firm will pay as $52 and explains that this is the wage on the supply curve at the profit-maximizing number of loggers (where marginal revenue product is equal to marginal factor cost).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the perfectly competitive wage would be $64 and explains that the wage would be determined by the intersection of the supply curve and the marginal revenue product curve.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should hire more loggers and explains that the ratio of the marginal product of labor to the wage (5) is greater than the ratio of the marginal product of capital to the rental price of capital (4), or the firm can get more output for their money by hiring more workers, or

$$\frac{MP_{Labor}}{P_{Labor}} > \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{150}{30} > \frac{200}{50}$$

$$5 > 4$$

k

Leadmill Company is a perfectly competitive pencil-manufacturing firm. Leadmill can sell all of the pencils it produces at a market price of $2 per dozen and can hire all the workers it needs at a wage rate of $8 per hour. The output of the workers at Leadmill is given in the table below.

Number of Workers	Output (dozens)
0	0
1	8
2	15
3	21
4	26
5	30
6	33
7	35
8	36

a. Using marginal analysis, state the condition for employing the profit-maximizing number of workers.

b. How many workers should Leadmill hire to maximize profit? Explain how you derived that number.

c. If the wage rate decreased to $6 dollars per hour, how many workers would Leadmill employ?

d. If the wage rate was $6 per hour and the price of pencils decreased to $1 per dozen, how many workers would Leadmill employ?

26. Respond to all parts of the question.

Part A

A profit-maximizing firm will hire workers until the marginal revenue product equals the marginal factor cost.

1 point: Marginal revenue product (MRP) = Marginal factor cost (MFC)

Acceptable answers include: MRP = MFC, MRP =W, MP_L x MR = W, additional revenue from one more worker = wage, but not MR = W.

	✓
0	1

Student receives 1/1 point(s)

1 point: Marginal revenue product (MRP) = Marginal factor cost (MFC)

k

Acceptable answers include: MRP = MFC, MRP =W, MP_L x MR = W, additional revenue from one more worker = wage, but not MR = W.

Part B

The marginal revenue product is determined by multiplying the marginal product of workers by the price of pencils ($2). Calculated in this way, the marginal revenue product for the first six workers is $16, $14, $12, $10, $8, and $6. The marginal factor cost for a firm like this one that can hire all the workers that it wants at a fixed wage is equivalent to that wage, which in this case is $8. The profit maximizing condition that marginal revenue product equals the wage rate is met when five workers are hired, making five the profit-maximizing number of workers. Note that the 5th worker costs the firm $8 and contributes $8 worth of output, so the firm is in fact indifferent between hiring four or five workers.

1 point - 4 or 5 workers

1 point - Hire until MRP = $8 = W

0	1	2 ✓

Student receives 2/2 point(s)

1 point - 4 or 5 workers

1 point - Hire until MRP = $8 = W

Part C

With a wage rate of $6, the firm would do well to hire 6 workers, because it is with 6 workers that the marginal revenue product equals the new wage. Since the 6th worker contributes $6 worth of output and costs $6, it is also possible that the firm will decide to stop hiring after the 5th worker.

1 point - 5 or 6 workers

0	1 ✓

Student receives 1/1 point(s)

1 point - 5 or 6 workers

Part D

With a pencil price of $1, the marginal revenue product for the first six workers is 8, 7, 6, 5, 4, 3, 2, and 1. Marginal revenue product equals wage when three workers are hired, meaning that profits will be maximized with two or three workers (the firm is indifferent between hiring the third or not).

1 point: 2 or 3 workers

k

0	1 ✓

Student receives 1/1 point(s)

1 point: 2 or 3 workers

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Malikah's Fashion Clothing.

Number of Garment Workers	Total Product per Hour
1	4
2	10
3	18
4	28
5	36
6	42
7	46
8	48

(a) After which garment worker do diminishing marginal returns begin for Malikah's Fashion Clothing? Explain using numbers.

(b) Assume Malikah's Fashion Clothing sells its clothes in a perfectly competitive market at a price of $8. Calculate the marginal revenue product of the fifth garment worker. Show your work.

(c) Malikah's Fashion Clothing hires garment workers in a perfectly competitive labor market for garment workers at a wage rate of $30 per hour, and the market price of clothes remains $8. How many garment workers will Malikah's Fashion Clothing hire to maximize its profit? Explain using marginal analysis.

(d) Assume the market price of clothes decreases as a result of a decrease in the number of consumers and Malikah's Fashion Clothing continues to operate. What will happen to each of the following?
(i) The marginal factor cost for Malikah's Fashion Clothing. Explain.
(ii) The marginal revenue product curve for Malikah's Fashion Clothing. Explain.

---

k

27. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that diminishing marginal returns begin after the fourth worker and explains that the marginal product (MP) of the fifth worker (8) was less than the MP of the fourth worker (10).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fifth worker as \$64 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$8 \times 8 = \$64$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 7 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 7^{th} worker (\$32) is greater than the marginal resource cost (MRC) or wage (\$30), but the MRP of the 8^{th} worker (\$16) is less than the MRC (\$30).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

k

The response does both of the following:

· States that the marginal factor cost for the firm will decrease and explains that a decrease in the price of clothes will lead to a decrease in demand for workers in that market, which will decrease the market wage and therefore decrease the firm's marginal factor cost because the firm is a wage taker.

· States that the marginal revenue product curve for the firm will shift to the left and explains that the marginal revenue product is the price of the product times the marginal product, so a decrease in the market price of clothes will decrease the marginal revenue product for every unit of labor.

Marginal analysis is essential to microeconomics decision making. Discuss how marginal analysis is used in each of the following cases.

a. To derive the supply curve for a perfectly competitive firm

b. To identify the least-cost combination of capital and labor used to produce a given level of output.

c. To regulate an industry that produces a product that generates negative externalities

28. Respond to all parts of the question.

Part A

2 Points

- **1 -** for equating MR = MC or P = MC
- **1** - for MC curve above AVC curve (or shut down price)

0	1	2 ✓

The student earns all of the following points:

- **1 -** for equating MR = MC or P = MC
- **1** - for MC curve above AVC curve (or shut down price)

Part B

1 Point

1 - for winner takes all.

k

0	1 ✓

The student earns all of the following points:

1 - for winner takes all.

Part C

2 Points

- **1 -** for observe that with a negative externality MSC>MPC. Thus, there is a need to regulate (e.g., per unit taxt) to make marginal private cost equal marginal social cost so as to achieve the equality to MSB and MSC.

OR

- **1 -** for equate the MB of reducing pollution to the MC of reducing pollution.

0	1	2 ✓

The student earns all of the following points:

- **1 -** for observe that with a negative externality MSC>MPC. Thus, there is a need to regulate (e.g., per unit taxt) to make marginal private cost equal marginal social cost so as to achieve the equality to MSB and MSC.

OR

- **1 -** for equate the MB of reducing pollution to the MC of reducing pollution.

---

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Mateo's Metalworks.

Number of Welders	Total Product per Hour
1	5
2	11
3	16
4	20
5	23
6	25
7	26
8	25

(a) Beginning with which welder do diminishing marginal returns set in for Mateo's Metalworks? Explain using numbers.

(b) Assume Mateo's Metalworks sells its welding services in a perfectly competitive market at a unit price of $10. Calculate the marginal revenue product of the seventh welder. Show your work.

(c) Mateo's Metalworks hires welders in a perfectly competitive labor market for welders at a wage rate of $35 per hour, and the market price of welding services remains $10. How many welders will Mateo's Metalworks hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is an increase in the productivity of all workers in the labor market for welders. What will happen to each of the following in equilibrium?
(i) The number of workers hired in the labor market for welders. Explain.
(ii) The wage rate Mateo's Metalworks will pay its welders. Explain.

29. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

k

The response states that diminishing marginal returns begin with the third worker and explains that the marginal product (MP) of the 3rd worker (5) is less than the MP of the 2nd worker (6).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the seventh worker as $10 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$10 \times 1 = \$10$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 4 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 4th worker ($40) is greater than the marginal resource cost (MRC) or wage ($35), but the MRP of the 5th worker ($30) is less than the MRC ($35).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

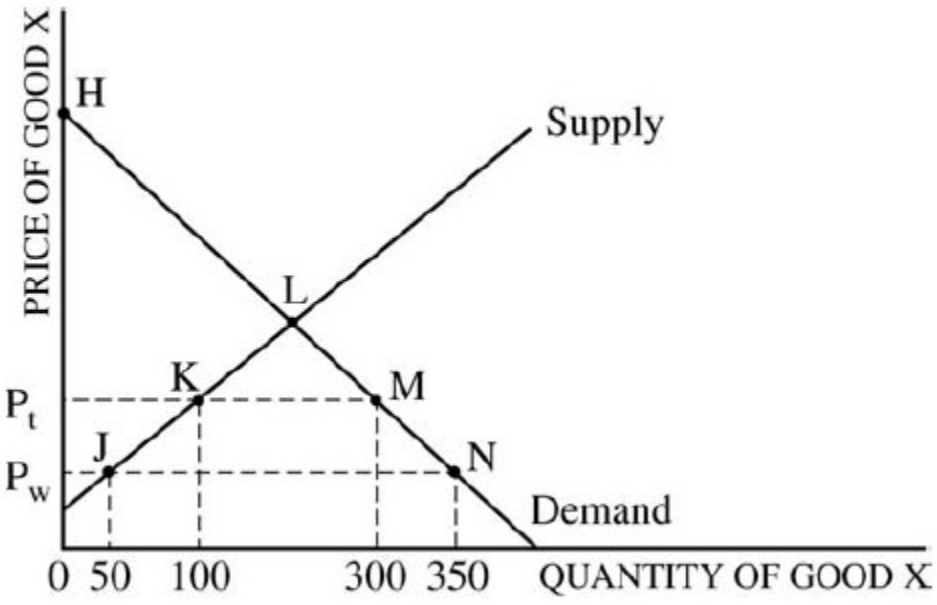
0	1	2 ✓

The response does both of the following:

· States that the number of workers hired in the labor market will increase and explains that an increase in the productivity of workers will increase the demand for labor in the market for welders.

· States that the wage rate Mateo's Metalworks will pay will increase and explains that the increase in the market demand for labor will increase the market wage, which increases the wage rate paid by the firm because the firm is a wage taker.

k



The diagram above shows the domestic supply and demand for good X in the country of Placonia.

a. If the current world price of good X is P_w, does Placonia export or import good X? Explain.

b. Given your answer in part (a), indicate the quantity of good X that Placonia exports or imports.

c. Assume that the government of Placonia imposes a tariff on good X, increasing the price from P_w to P_t.

   Using the labels in the graph, indicate the change in each of the following in Placonia.

   i. Consumer surplus

   ii. Producer surplus

d. Indicate how employment in the domestic industry that produces good X is affected by the tariff.

30. Respond to all parts of the question.

Part A

1 point – Placonia imports the good

1 point – The domestic opportunity cost of producing good X is higher than the world price (PW) for unit JN. Or, they can get it cheaper at the world price.

k

0	1	2 ✓

Student receives 2/2 point(s)

1 point – Placonia imports the good

1 point – The domestic opportunity cost of producing good X is higher than the world price (PW) for unit JN. Or, they can get it cheaper at the world price.

Part B

1 point: They import 300 (=350 - 50) units or JN units

0	1 ✓

Student receives 1/1 point(s)

1 point: They import 300 (=350 - 50) units or JN units

Part C

1 point – Consumer surplus decreases from PwNH to PtMH, or a decrease of MNPWPt

1 point – Producer surplus increases by JKPtPW

0	1	2 ✓

Student receives 2/2 point(s)

1 point – Consumer surplus decreases from PwNH to PtMH, or a decrease of MNPWPt

1 point – Producer surplus increases by JKPtPW

Part D

1 point: Employment would increase because domestic production of good X increases in Placonia

k

0	1 ✓

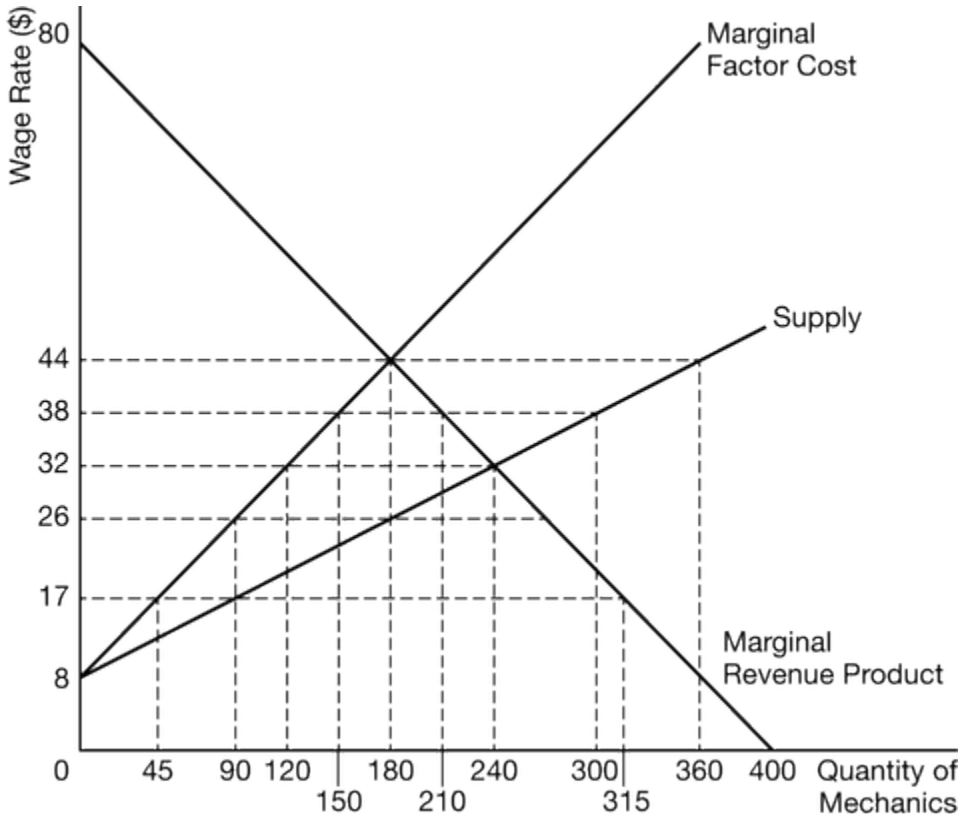
Student receives 1/1 point(s)

1 point: Employment would increase because domestic production of good X increases in Placonia

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Molly's Motorcycles is the only motorcycle repair shop in a small remote town, and Molly's Motorcycles is the only employer of mechanics in the area. The graph below shows the market for mechanics with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) Identify the profit-maximizing number of mechanics that Molly's Motorcycles will hire. Explain using the labeling on the graph.

(b) Identify the profit-maximizing wage rate that Molly's Motorcycles will pay its mechanics. Explain using the labeling on the graph.

(c) If the wage rate is $38, state whether there will be a shortage or a surplus of mechanics and calculate its size. Show your work.

(d) If the marginal product of mechanics decreases, what will happen to the quantity of services provided by Molly's Motorcycles? Explain.

(e) Assume instead that Molly's Motorcycles uses both labor and capital in providing its services. The marginal product of the last unit of labor hired is 100 repairs per day and the marginal product of the last unit of capital rented is 60 repairs per

k

day; the daily wage rate for labor is $20 and the daily rental price for capital is $30. To minimize the cost of providing its current level of service, should Molly's Motorcycles rent more capital, less capital, or the same amount of capital? Explain using marginal analysis.

31. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies 180 as the profit-maximizing number of beauticians and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies $26 as the wage the firm will pay and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a surplus at a wage of $38, calculates the surplus as 90 mechanics, and shows the work.

$$\text{Surplus} = \text{Quantity Supplied} - \text{Quantity Demanded} = 300 - 210 = 90$$

Part D

k

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the quantity of services provided will decrease and explains that as each worker's extra output (marginal product) decreases, the firm's MRP decreases, decreasing the quantity of labor hired as well as the quantity of output produced by the firm.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should rent less capital and explains that the ratio of the marginal product of labor to the wage (5) is greater than the ratio of the marginal product of capital to the rental price of capital (2), or the firm can get more output for their money by renting less capital, or

$$\frac{MP_{Labor}}{P_{Labor}} > \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{100}{20} > \frac{60}{30}$$

$$5 > 2$$

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Gigantic Pharmaceutical Corporation has a patent on a prescription drug, making it the only manufacturer of that prescription drug. Gigantic is currently earning a positive economic profit.

(a) Draw a correctly labeled graph for Gigantic and show each of the following.

(i) The profit-maximizing quantity, labeled Q_G

(ii) The profit-maximizing price, labeled P_G

(iii) The average total cost curve, labeled ATC

(iv) The area representing the consumer surplus, shaded completely

(b) Suppose the demand for the prescription drug increases, and Gigantic hires its warehouse workers in a perfectly competitive labor market.

(i) What will happen to Gigantic's demand for warehouse workers? Explain.

(ii) What will happen to the wage rate Gigantic pays its warehouse workers and the number of warehouse workers it hires?

(c) After Gigantic's patent expires, another firm enters the prescription drug market and produces an identical drug that sells for a lower price.

(i) What will happen to Gigantic's producer surplus?

(ii) What will happen to the consumer surplus in this prescription drug market? Explain.

32. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2	3	4	5 ✓

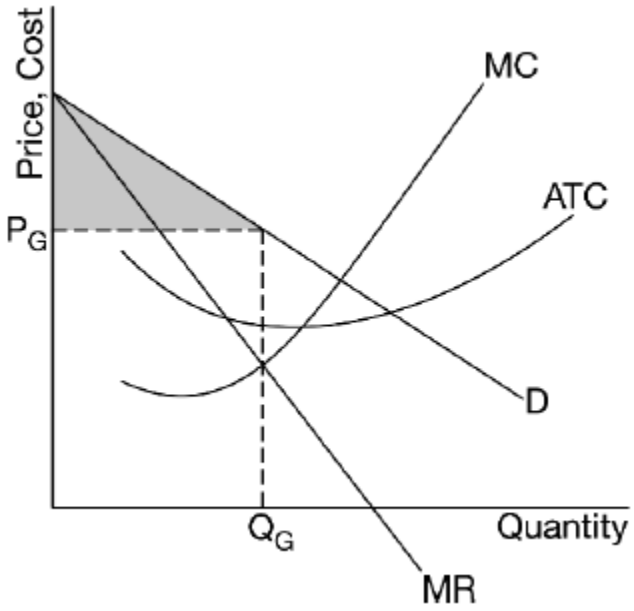
The response accurately includes all five of the following

- ☐ A correctly labeled graph of the monopoly showing downward-sloping demand (D) and marginal revenue (MR) curves with the MR curve below the demand curve.

k

- The profit-maximizing quantity, labeled Q_G, where $MR = MC$
- The profit-maximizing price, labeled P_G, from the demand curve at Q_G, and above the average total cost (ATC) curve.
- The marginal cost (MC) curve rising and passing through the minimum point of the ATC curve.
- The area representing the consumer surplus, completely shaded.

Solution



Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following.

- States that Gigantic's demand for warehouse workers will increase and explains that the increase in the demand for the product raises the product price and the marginal revenue product of labor.
- States that the wage rate Gigantic pays to its warehouse workers will not change and the number of workers hired will increase.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1	2 ✓

The response does both of the following.

- ☐ States that Gigantic's producer surplus will decrease.
- ☐ States that the consumer surplus will increase and explains that because of the increased competition, the price will decrease, and the quantity will increase.

P & L is a profit-maximizing shirt-manufacturing firm. The firm can sell all the shirts it can produce to retailers at a price of $20 each. P & L can hire all of the workers it wants at a market wage of $120 per day per worker. The table below shows the firm's short-run production function.

Number of Workers	Number of Shirts per Day
0	0
1	10
2	25
3	45
4	60
5	72
6	80
7	85
8	82

a. In what kind of market structure does this firm sell its output? How can you tell?

b. In what kind of market structure does this firm hire its workers? How can you tell?

c. Calculate the marginal revenue product of the third worker. Show your work.

d. How many workers should the firm hire to maximize profit? Explain.

33. Respond to all parts of the question.

Part A

2 Points

- One point is earned for indicating perfect competition.
- One point is earned for a correct explanation: The price is constant, or the firm is a price taker in the product market.

k

0	1	2 ✓

The student earns all of the following points:

- One point is earned for indicating perfect competition.
- One point is earned for a correct explanation: The price is constant, or the firm is a price taker in the product market.

Part B

2 Points

- One point is earned for indicating perfect competition.
- One point is earned for a correct explanation: The wage rate is constant, or the firm is a price taker in the labor market.

0	1	2 ✓

The student earns all of the following points:

- One point is earned for indicating perfect competition.
- One point is earned for a correct explanation: The wage rate is constant, or the firm is a price taker in the labor market.

Part C

2 Points

- One point is earned for stating that MRP is $400.
- One point is earned for showing the calculation: MRP = P × MP, so MRP = 20 × $20 = $400

0	1	2 ✓

The student earns all of the following points:

- One point is earned for stating that MRP is $400.

k

- One point is earned for showing the calculation: MRP = P × MP, so MRP = 20 × $20 = $400

Part D

2 Points

- One point is earned for indicating six workers, or in between six and seven workers.
- One point is earned for a correct explanation: MRP > W for the sixth worker, but MRP < W for the seventh worker.

0	1	2 ✓

The student earns all of the following points:

- One point is earned for indicating six workers, or in between six and seven workers.
- One point is earned for a correct explanation: MRP > W for the sixth worker, but MRP < W for the seventh worker.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Avonni's Painting Company.

Number of Painters	Total Product per Hour
1	120
2	250
3	370
4	420
5	460
6	490
7	510
8	515

(a) Beginning with which painter do diminishing marginal returns set in for Avonni's Painting Company? Explain using numbers.

(b) Assume Avonni's Painting Company sells its painting services in a perfectly competitive market at a price of $3. Calculate the marginal revenue product of the second painter. Show your work.

(c) Avonni's Painting Company hires painters in a perfectly competitive labor market for painters at a wage rate of $140 per hour, and the market price of services remains $3. How many painters will Avonni's Painting Company hire to maximize its profit? Explain using marginal analysis.

(d) Assume painters must pay for a certification exam before they can work in this industry. If the cost of that exam increases, what will happen to each of the following in equilibrium?
(i) The market wage rate. Explain.
(ii) The number of workers hired in the labor market. Explain.

34. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin with the third worker and explains that the marginal product (MP) of the third worker (120) is less than the MP of the second worker (130).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the second worker as $390 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$3 \times 130 = \$390$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 4 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 4^{th} worker ($150) is greater than the marginal resource cost (MRC) or wage ($140), but the MRP of the 5^{th} worker ($120) is less than the MRC ($140).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the market wage rate will increase and explains that an increase in the cost of the exam will lead to a decrease in the supply of workers in that market.

· States that the number of workers hired in the labor market will decrease and explains that the increase in the wage rate

k

resulting from the decrease in the supply of workers in that market will lead to fewer workers hired given the downward-sloping demand curve.

k

Peaches and nectarines are substitute goods, and both are produced under conditions of competitive long-run equilibrium.

a. Joyce, a producer in the peach industry, discovers a technological breakthrough that only reduces the cost of producing peaches. Explain how the change in technology will affect each of the following for Joyce.

    i. Quantity of peaches produced

    ii. Price of peaches

    iii. Short-run profits

b. Now assume that all other peach-producing firms adopt the new technology. Explain how the adoption of the new technology will affect each of the following in the peach-producing industry.

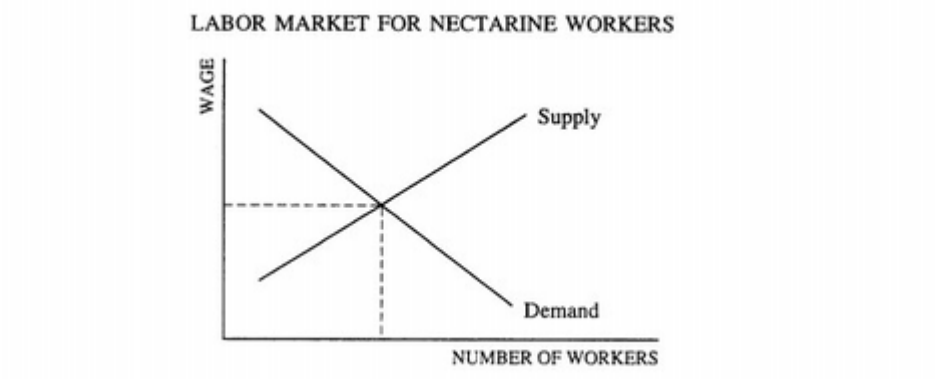
    i. Price of peaches

    ii. Quantity of peaches produced

c. This new technology is not applicable to the production of nectarines. Explain how the changes that occurred in the peach industry will affect each of the following in the nectarine industry.

    i. Price of nectarines

    ii. Quantity of nectarines



d. The graph above depicts the supply and demand curves for workers in the nectarine industry before the technological breakthrough in the peach industry.

    Explain how the technological breakthrough in the peach industry will affect each of the following in the labor market for nectarine workers.

    i. Wage rate for nectarine workers

    ii. Number of nectarine workers hired

k

35. Respond to all parts of the question.

Part A

3 Points

- **1 -** An explanation that costs have decreased, shifting the MC cost curve and resulting in a new profiting maximizing higher level of output.
- **1 -** Price remains constant because of perfect competition. Thus, Joyce cannot affect the market price.
- **1 -** The student must show convincingly that short-run profits increase. One of the following explanations is acceptable:
    - Price is constant and costs decrease.
    - Costs have decreased while total revenue has increased due to constant price and increased output.
    - If the student has indicated about that the price has decreased, then the student must argue that average costs decrease more than the price decreases (or equivalent) to get an increase in Joyce's profits.

0	1	2	3 ✓

The student earns all of the following points:

- **1 -** An explanation that costs have decreased, shifting the MC cost curve and resulting in a new profiting maximizing higher level of output.
- **1 -** Price remains constant because of perfect competition. Thus, Joyce cannot affect the market price.
- **1 -** The student must show convincingly that short-run profits increase. One of the following explanations is acceptable:
    - Price is constant and costs decrease.
    - Costs have decreased while total revenue has increased due to constant price and increased output.
    - If the student has indicated about that the price has decreased, then the student must argue that average costs decrease more than the price decreases (or equivalent) to get an increase in Joyce's profits.

Part B

2 Points

- **1 -** Indicating that the industry supply curve shifts to the right; graphically or verbally.
- **1 -** Equilibrium price and quantity effects. A 1/2 point for price decrease and 1/2 point for quantity increase.

k

0	1	2 ✓

The student earns all of the following points:

- **1 -** Indicating that the industry supply curve shifts to the right; graphically or verbally.
- **1 -** Equilibrium price and quantity effects. A 1/2 point for price decrease and 1/2 point for quantity increase.

Part C

2 Points

- **1 -** Decrease in demand resulting from the price decrease in peaches and the fact that peaches and nectarines are substitutes. The reason must be given.
- **1/2 -** Decrease in nectarine equilibrium price.
- **1/2 -** Decrease in nectarine equilibrium quantity.

0	1	2 ✓

The student earns all of the following points:

- **1 -** Decrease in demand resulting from the price decrease in peaches and the fact that peaches and nectarines are substitutes. The reason must be given.
- **1/2 -** Decrease in nectarine equilibrium price.
- **1/2 -** Decrease in nectarine equilibrium quantity.

Part D

2 Points

- **1 -** Leftward shift in demand curve due to decrease in MRP_1 or, possibly VMP_L; the student must link the price change in the product market to the demand change in the labor market.
- **1/2 -** Wage rate declines.
- **1/2 -** Quantity of labor hired decreases.

k

0	1	2 ✓

The student earns all of the following points:

- **1 -** Leftward shift in demand curve due to decrease in MRP_1 or, possibly VMP_L; the student must link the price change in the product market to the demand change in the labor market.
- **1/2 -** Wage rate declines.
- **1/2 -** Quantity of labor hired decreases.

The labor market in the town of Bazra is perfectly competitive, and 10 percent of the labor force is employed in the clothing industry.

a. Assume that the clothing manufacturers close their plants in Bazra. Using a correctly labeled supply and demand graph, predict the impact that closing these plants will have on each of the following.
    i. The wage rate and number of workers employed in Bazra
    ii. The number of workers in Bazra looking for work who cannot find employment at the wage rate you identified in (i)

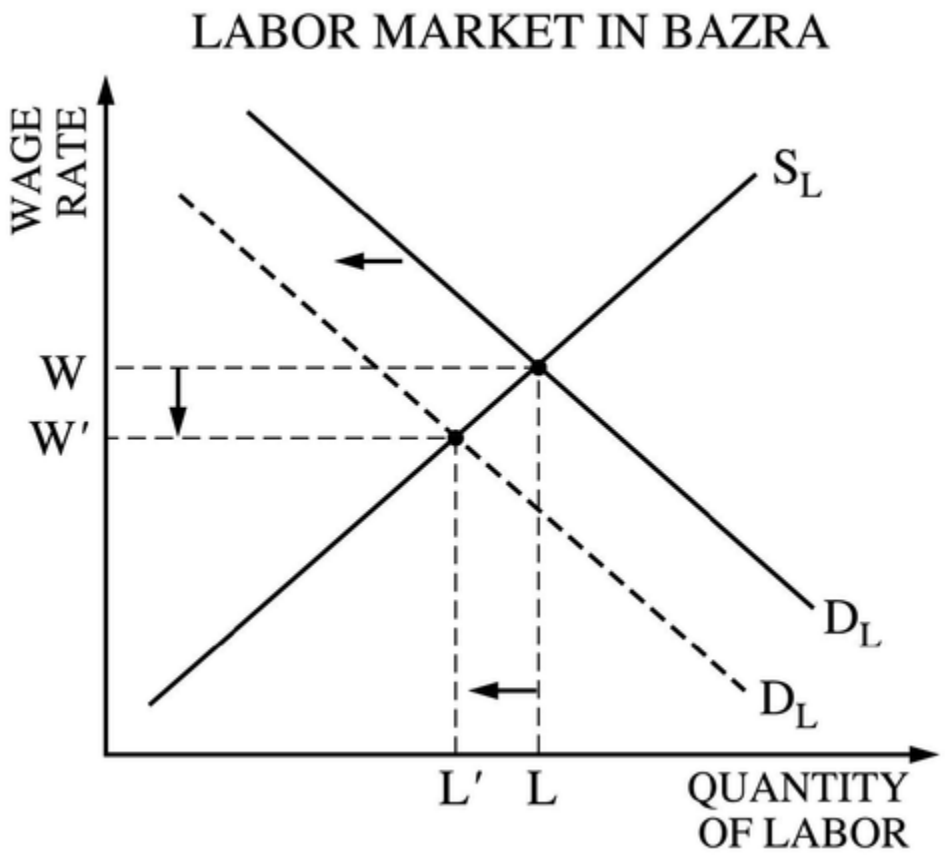
b. After the clothing manufacturers closed their plants in Bazra, the town passes a law that establishes an effective minimum wage. What impact will this minimum wage have on each of the following?
    i. The wage rate and number of workers employed in Bazra
    ii. The number of workers in Bazra looking for work who cannot find employment

c. Assume that the minimum wage remains in effect and there is an increase in the demand for goods produced in Bazra. What happens to employment in Bazra? Explain why.

36. Respond to all parts of the question.

Part A

k



1 point: correctly labeled graph without regard to the shift

1 point: shifting the labor demand curve to the left

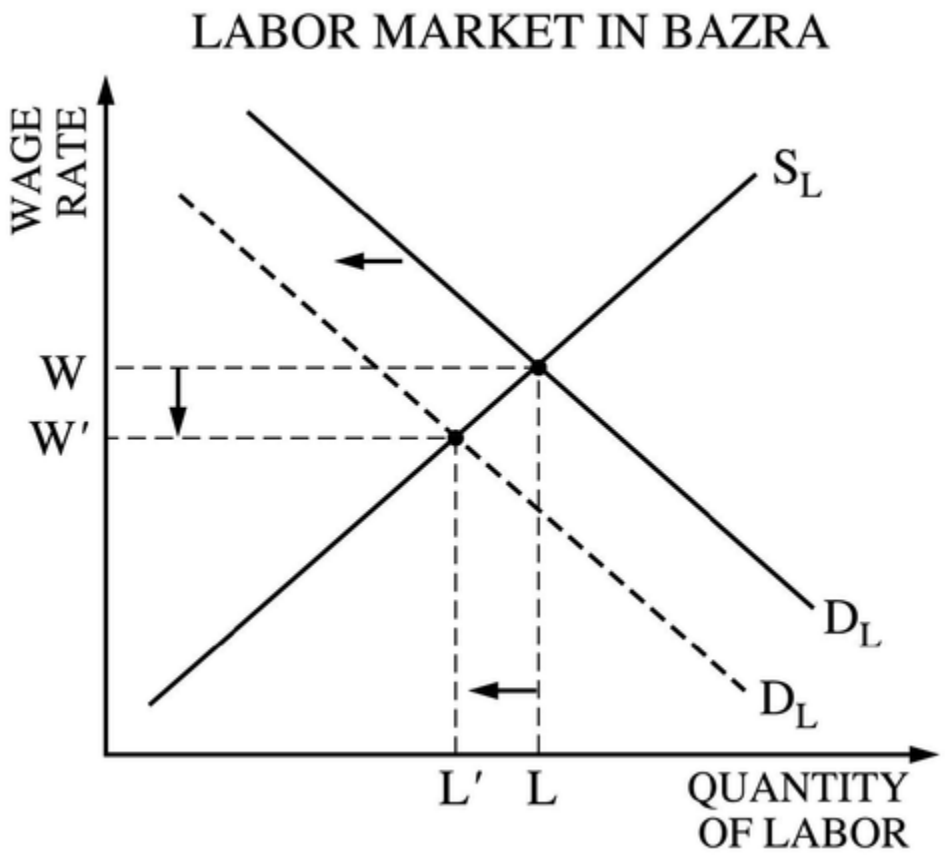
1 point: (i) wage rate and the number employed would fall

1 point: (ii) number of unemployed workers is equal to zero

0	1	2	3	4 ✓

Student receives 4/4 point(s)

k



1 point: correctly labeled graph without regard to the shift

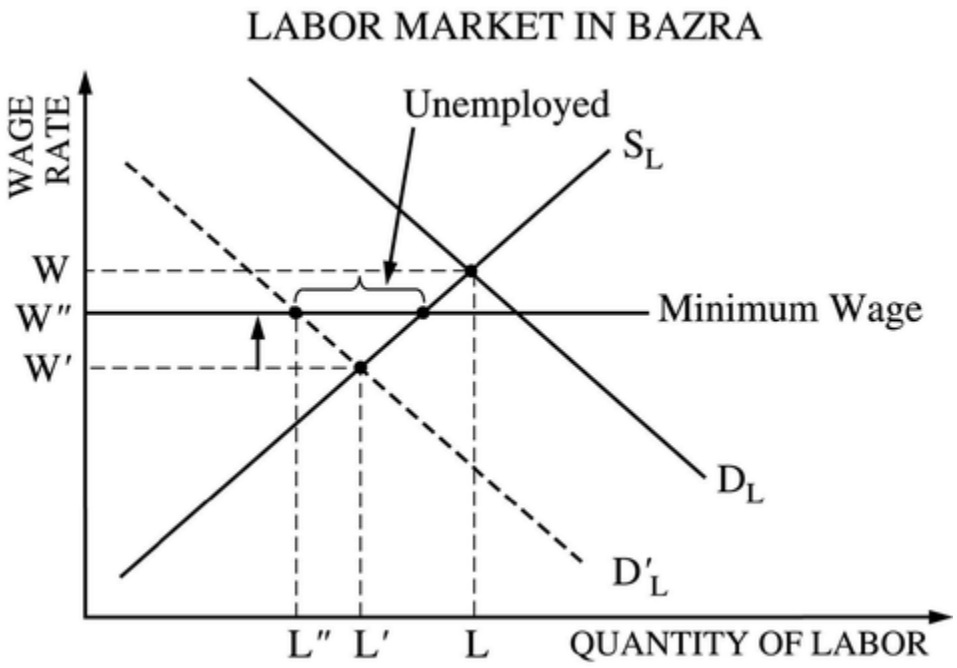
1 point: shifting the labor demand curve to the left

1 point: (i) wage rate and the number employed would fall

1 point: (ii) number of unemployed workers is equal to zero

Part B

k



1 point: the wage rate will rise

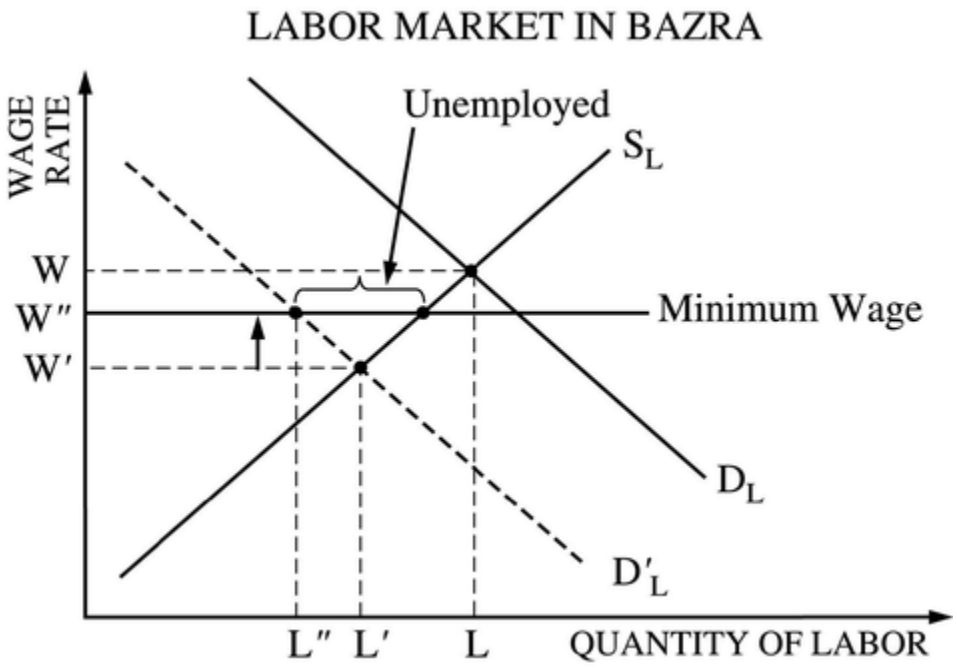
1 point: the number or workers employed will fall

1 point: the number of unemployed workers will rise

0	1	2	3 ✓

Student receives 3/3 point(s)

k



1 point: the wage rate will rise

1 point: the number or workers employed will fall

1 point: the number of unemployed workers will rise

Part C

1 point: employment increases

1 point: the increased demand for goods causes the (derived) demand for labor to increase, shifting the the demand curve to the right.

0	1	2 ✓

Student receives 2/2 point(s)

1 point: employment increases

1 point: the increased demand for goods causes the (derived) demand for labor to increase, shifting the the demand curve to the right.

---

k

Petsall Corporation is a profit-maximizing monopolist. It sells a patented rabies vaccine for pets and earns economic profits.

a. Draw a correctly labeled graph that shows each of the following for Petsall.

    i. Output and price of the vaccine

    ii. Area of economic profits

b. Assume that Petsall hires its production workers in a perfectly competitive labor market at the wage rate of $20 per hour.

    i. State the marginal conditions for hiring the profit-maximizing amount of labor.

    ii. Draw a correctly labeled graph that shows the labor supply and demand curves for Petsall and indicate the profit-maximizing quantity of labor.

c. Suppose that the market wage rate now falls to $15 per hour. Show on your diagram in (b) (ii) how each of the following would be affected.

    i. The supply of labor to Petsall

    ii. The amount of labor Petsall would hire

d. Given the lower wage rate in (c), indicate how each of the following would change.

    i. Total fixed cost

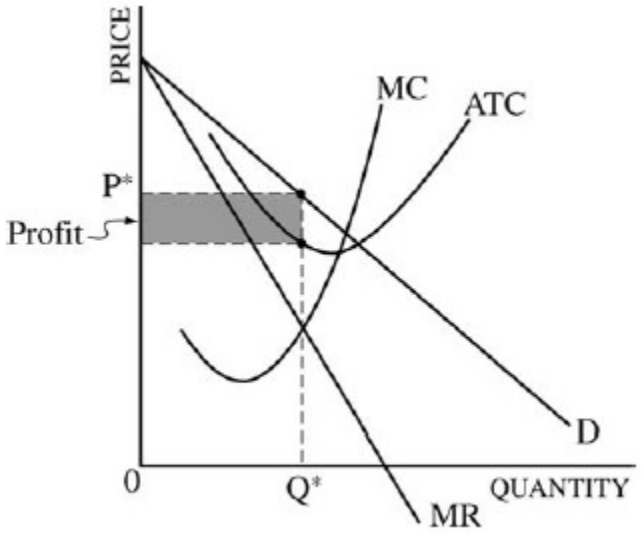
    ii. Marginal cost

    iii. Price of the product

37. Respond to all parts of the question.

Part A

k



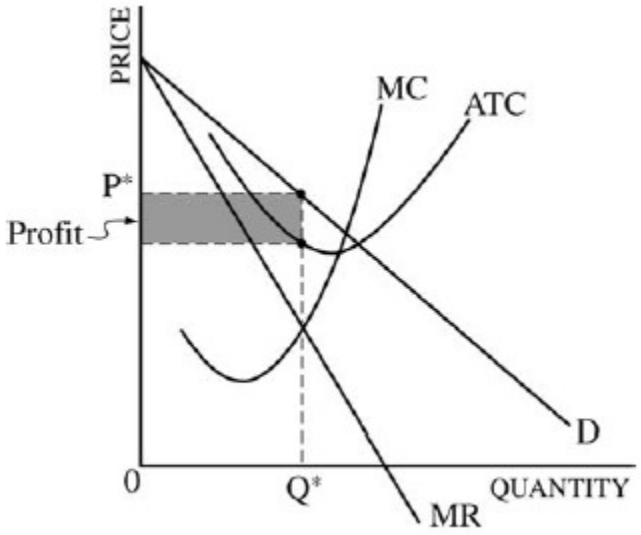
4 points:

- **One point is earned for a graph with downward sloping demand curve with MR below.**
- **One point is earned for showing output at MR=MC.**
- **One point is earned for showing price on the demand curve above MR=MC.**
- **One point is earned for showing the area of profit, shaded or labeled.**

0	1	2	3	4 ✓

Student receives 4/4 point(s)

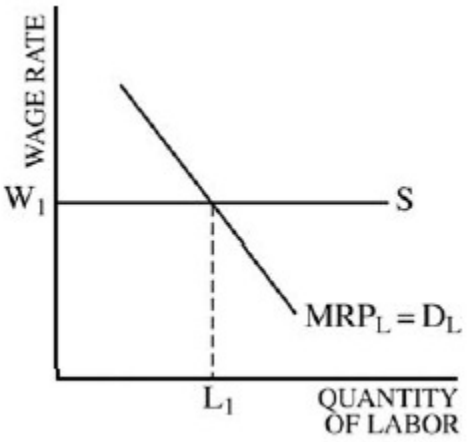
k



4 points:

- One point is earned for a graph with downward sloping demand curve with MR below.
- One point is earned for showing output at MR=MC.
- One point is earned for showing price on the demand curve above MR=MC.
- One point is earned for showing the area of profit, shaded or labeled.

Part B



4 points:

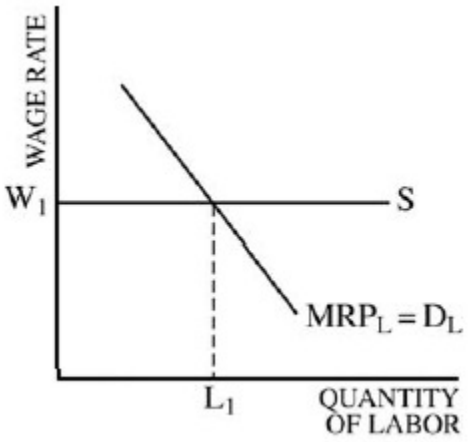
- One point is earned for stating that MRP=MFC or MRP=Wage or MRP=MRC.
- One point is earned for drawing a correct graph with downward sloping labor-demand curve.
- One point is earned for drawing a horizontal labor-supply curve at the wage rate.

k

- One point is earned for indicating the profit-maximizing quantity of labor.

0	1	2	3	4 ✓

Student receives 4/4 point(s)



4 points:

- One point is earned for stating that MRP=MFC or MRP=Wage or MRP=MRC.
- One point is earned for drawing a correct graph with downward sloping labor-demand curve.
- One point is earned for drawing a horizontal labor-supply curve at the wage rate.
- One point is earned for indicating the profit-maximizing quantity of labor.

Part C

2 points:

- One point is earned for showing that labor-supply curve shifts down.
- One point is earned for showing that the amount of labor hired increases.

0	1	2 ✓

Student receives 2/2 point(s)

2 points:

- One point is earned for showing that labor-supply curve shifts down.

k

- One point is earned for showing that the amount of labor hired increases.

Part D

3 points:

- One point is earned for indicating that the total fixed cost would not change.
- One point is earned for indicating that the marginal cost would fall.
- One point is earned for indicating that the product price would fall.

0	1	2	3 ✓

Student receives 3/3 point(s)

3 points:

- One point is earned for indicating that the total fixed cost would not change.
- One point is earned for indicating that the marginal cost would fall.
- One point is earned for indicating that the product price would fall.

k

Include correctly labeled diagrams, if useful or required, in explaining your answer. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

On the Island of Gratin, potatoes are produced in a perfectly competitive constant cost industry. The market for potatoes is currently in long-run equilibrium at the market price of $5 per sac.

(a) Draw a correctly labeled graph for the potato market and for farmer Lamo, and show each of the following.

(i) The market equilibrium quantity and price, labeled Q_M and $5, respectively
(ii) The quantity produced and the price for farmer Lamo, labeled Q_L and $5, respectively

(b) Believing that the incomes of potato farmers are unfairly low, the government of Gratin imposes a binding price floor at $7 per sac. The government will purchase any surpluses of potatoes. On your graph in part (a) show the following.

(i) The market quantity of potatoes that would be supplied at the price floor, labeled Q_F
(ii) The profit farmer Lamo earns, shaded completely

(c) If the absolute value of the price elasticity of demand is 0.92, would consumer spending on potatoes increase, decrease, or stay the same as a result of the price floor? Explain.

(d) How would the price floor affect the demand for labor by potato farmers?

(e) Potatoes, corn, and rice are all produced on the island of Gratin in perfectly competitive markets.

(i) Assume corn is a substitute in production (an alternate output) for potatoes. How would setting the price floor on potatoes affect the equilibrium price and quantity of corn? Explain.
(ii) As a result of an increase in the price of rice, the demand for potatoes increased. Are rice and potatoes substitutes or complements in consumption?

38. Respond to all parts of the question:

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2	3	4 ✓

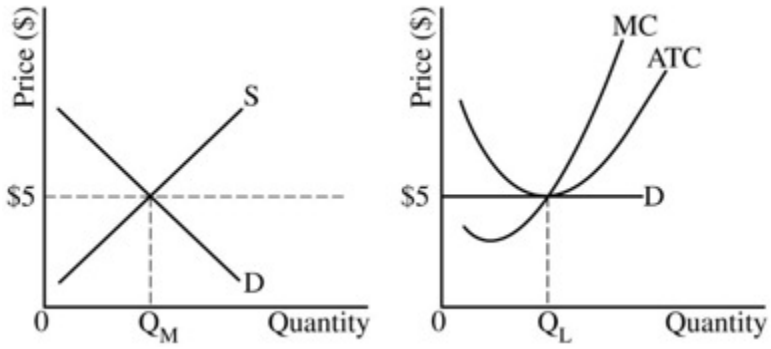
The response accurately includes all four of the criteria below

- ☐ A correctly labeled graph of the market for potatoes with the equilibrium quantity Q_M and the equilibrium price $5
- ☐ A horizontal demand curve for Lamo coming from the market equilibrium price of $5

k

- [ ] The profit-maximizing quantity Q_L, where $P=MC$
- [ ] ATC tangent to Lamo's demand curve at Q_L

Solution



Part B

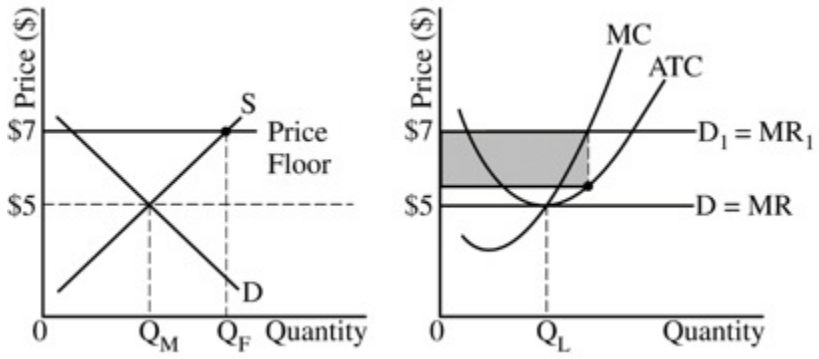
Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response accurately includes both of the criteria below.

- [ ] The market quantity of potatoes that would be supplied at the price floor, labeled Q_F
- [ ] The profit farmer Lamo earns with the price floor, shaded completely.

Solution



Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

A response that earns the point for part (c) must explain why consumer spending on potatoes will increase.

k

0	1 ✓

The response states that consumer spending on potatoes will increase and explains that because the demand for potatoes is inelastic, the price increase will result in an increase in total spending; OR Because demand is inelastic, the percentage increase in price outweighs the percentage decrease in the quantity demanded of potatoes, resulting in an increase in total spending on potatoes.

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

A response that earns the point for part (d) must state the correct change in the demand for labor and/or the demand curve

0	1 ✓

The response states that the demand for labor will increase and/or the demand curve will shift to the right.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

A response that earns the point for part (c) must explain why consumer spending on potatoes will increase.

0	1	2 ✓

The response accurately includes both of the criteria below.

- ☐ States that the equilibrium price of corn will increase and the equilibrium quantity of corn will decrease.
- ☐ States that potatoes and rice are substitutes in consumption.

k

Pride Textiles produces and sells towels in a perfectly competitive market. Pride Textiles hires its workers in a perfectly competitive labor market. Assume that the market wage rate for workers is $80 per day.

a. State the conditions necessary for hiring the profit-maximizing amount of labor.

b. At the profit-maximizing level of output, suppose that the marginal product of the last worker hired is 20 towels per day. Calculate the price of a towel.

c. Draw a correctly labeled graph of the labor supply and demand curves for Pride Textiles, and show the equilibrium amount of labor hired.

d. Given your answer to part (b), if the price of a towel increases, explain how Pride's profit-maximizing quantity of labor will be affected.

39. Respond to all parts of the question.

Part A

1 point:

- One point is earned for stating that MRP=MFC.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for stating that MRP=MFC.

Part B

1 point:

- One point is earned for calculating the price: $80/20= $4

0	1 ✓

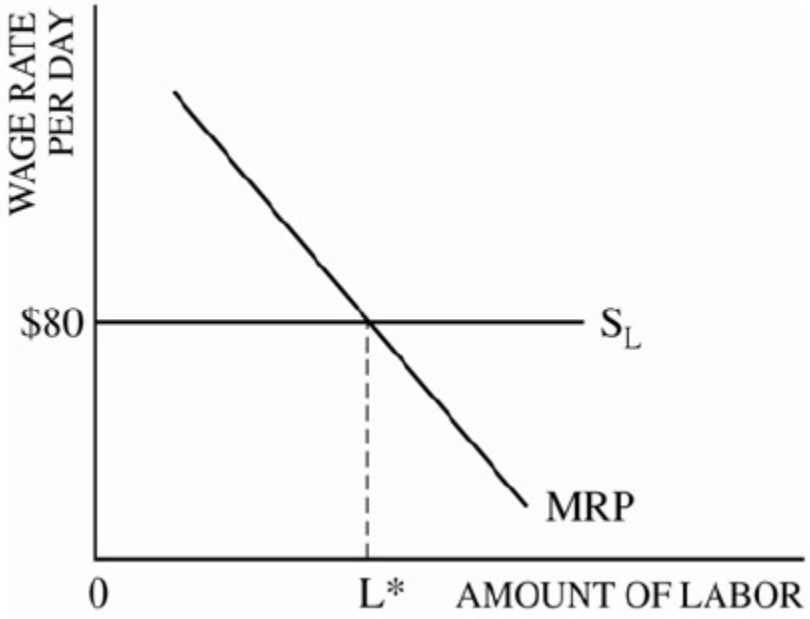
Student receives 1/1 point(s)

1 point:

k

- One point is earned for calculating the price: $80/20= $4

Part C



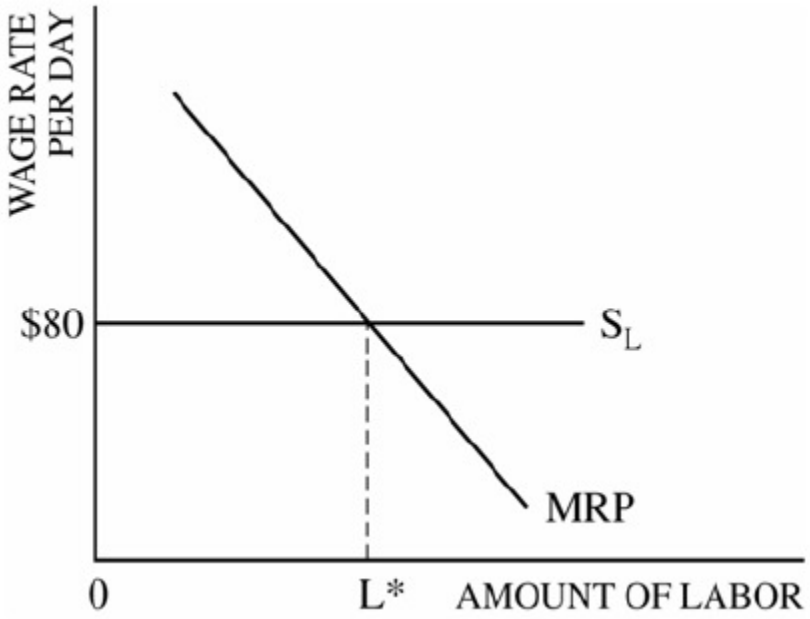
3 points:

- One point is earned for a correctly labeled graph with downward-sloping demand curve.
- One point is earned for drawing a horizontal supply curve.
- One point is earned for showing equilibrium amount of labor.

0	1	2	3 ✓

Student receives 3/3 point(s)

k



3 points:

- One point is earned for a correctly labeled graph with downward-sloping demand curve.
- One point is earned for drawing a horizontal supply curve.
- One point is earned for showing equilibrium amount of labor.

Part D

2 points:

- One point is earned for stating that the amount of labor will increase.
- One point is earned for explaining that MRP>W.

0	1	2 ✓

Student receives 2/2 point(s)

2 points:

- One point is earned for stating that the amount of labor will increase.
- One point is earned for explaining that MRP>W.

k

In answering the question, you should emphasize the line of reasoning that generated your results; it is not enough to list the results of your analysis. Include diagrams, if useful or required, in explaining your answers. All diagrams should be clearly labeled.

Workers	Output
3	60
4	80
5	105
6	125
7	140
8	150

The table above describes the production function for John Jones's T-shirt firm. Jones can hire as many workers as he wants for $75 per day and can sell as many T-shirts as he wants for $5 each.

a. Given the production information above, do each of the following.

   i. Draw a graph showing this firm's demand and supply curves for workers.

   ii. Explain how Jones will determine the number of workers to hire.

   iii. Indicate how many workers Jones will hire.

b. Assume the wage rate at which Jones can hire all the workers he wants increases to $120 per day, and the selling price of T-shirts increases to $6. Do each of the following.

   i. Explain how the demand for workers will change.

   ii. Indicate how many workers Jones will hire.

   iii. Indicate the quantity of T-shirts Jones will produce.

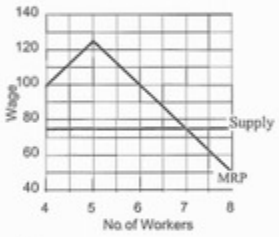
c. In which type of market structure does Jones sell his T-shirts? Explain how you know.

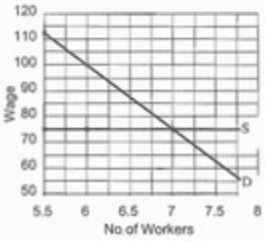
40. Respond to all parts of the question.

Part A

k

		Part (a) P = $5		Part (b) P = $6	
Workers	Output	Revenue	MRP_L	Revenue	MRP_L
3	60	300		360	
4	80	400	100	480	120
5	105	525	125	630	150
6	125	625	100	750	120
7	140	700	75	840	90
8	150	750	50	900	60





One point is earned for a supply curve horizontal at $75.(see either graph below).

One point is earned for a labor demand curve as in either graph below The demand curve must have two correct wage/ labor combinations.

One point is earned for MRP = MFC.

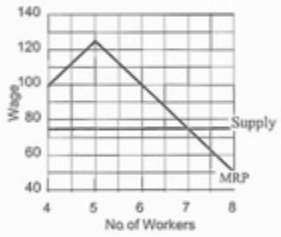
One point is earned for 6 or & workers.

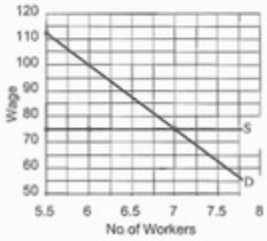
0	1	2	3	4 ✓

The student earns all of the following points:

k

		Part (a) P = $5		Part (b) P = $6	
Workers	Output	Revenue	MRP_L	Revenue	MRP_L
3	60	300		360	
4	80	400	100	480	120
5	105	525	125	630	150
6	125	625	100	750	120
7	140	700	75	840	90
8	150	750	50	900	60





One point is earned for a supply curve horizontal at $75.(see either graph above).

One point is earned for a labor demand curve as in either graph below The demand curve must have two correct wage/ labor combinations.

One point is earned for MRP = MFC.

One point is earned for 6 or & workers.

Part B

- **1 -** for an increase in the demand for labor.
- **1 -** for tying the increase in the demand for labor to the product price increase.
- **1 -** for correct number of workers.
- **1/2 -** for correct quantity of T-shirts produced.

0	1	2	3 ✓

The student earns all of the following points:

- **1 -** for an increase in the demand for labor.

k

- **1 -** for tying the increase in the demand for labor to the product price increase.
- **1 -** for correct number of workers.
- **1/2 -** for correct quantity of T-shirts produced.

Part C

2 Points

- **1 -** for perfect competition.
- **1 -** for explanation.

0	1	✓ 2

The student earns all of the following points:

- **1 -** for perfect competition.
- **1 -** for explanation.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Raydisha's Radiology Clinic.

Number of Radiologists	Total Product per Hour
1	30
2	58
3	80
4	99
5	112
6	122
7	125
8	123

(a) After which radiologist do diminishing marginal returns begin for Raydisha's Radiology Clinic? Explain using numbers.

(b) Assume Raydisha's Radiology Clinic sells its radiological services in a perfectly competitive market at a unit price of $10. Calculate the marginal revenue product of the seventh radiologist. Show your work.

(c) Raydisha's Radiology Clinic hires radiologists in a perfectly competitive labor market for radiologists at a wage rate of $120 per hour, and the market price of radiological services remains $10. How many radiologists will Raydisha's Radiology Clinic hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is a decrease in the demand for radiological services in the market and Raydisha's Radiology Clinic continues to operate. What will happen to each of the following?
(i) The market wage rate. Explain.
(ii) The marginal revenue product curve for Raydisha's Radiology Clinic. Explain.

41. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin after the first worker and explains that the marginal product (MP) of the second worker (28) is less than the MP of the first worker (30).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the seventh worker as $30 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$10 \times 3 = \$30$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 5 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 5^{th} worker ($130) is greater than the marginal resource cost (MRC) or wage ($120), but the MRP of the 6^{th} worker ($100) is less than the MRC ($120).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the market wage will decrease and explains that a decrease in the market demand for radiological services will lead to a decrease in demand for radiologists because the demand for radiologists is dependent on (or derived from) the demand for radiological services.

k

· States that the marginal revenue product curve for the firm will shift to the left and explains that the marginal revenue product is the price of the service times the marginal product, so a decrease in the demand for radiological services will decrease the price of radiological services and will therefore decrease the marginal revenue product for every unit of labor.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Number of Workers	Number of Parked Cars
0	0
1	8
2	20
3	34
4	45
5	54
6	60
7	63

Assume that Schmitt Inc. provides car parking services in a perfectly competitive output market and hires labor in a perfectly competitive input market. The market price per car parked is $10, the daily market wage per worker is $100, and fixed costs are $50 per day. The table above shows the number of workers required to park different quantities of cars per day.

(a) Calculate the marginal revenue product of the second worker. Show your work.

(b) How many workers will Schmitt Inc. hire to maximize profit? Relative to this number of hired workers, explain why Schmitt Inc. will not hire one additional worker. Your answer must use marginal analysis and numbers from the table.

(c) Calculate the daily profit for Schmitt Inc. at the profit-maximizing quantity identified in part (b).
Show your work.

(d) Suppose new legislation requires each worker in the parking industry to purchase an individual insurance policy at the worker's expense in order to legally park cars.

(i) Will the market wage paid by a typical firm in this industry increase, decrease, or stay the same in the long run?
(ii) For a typical firm in the industry, will the number of workers hired in the short run increase, decrease, or stay the same? Explain.

42. Respond to all parts of the question:

k

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

The response must show appropriate work in order to receive the point.

0	1 ✓

The response calculates the marginal revenue product of the second worker as $\$120$ and shows the work.

$\text{Marginal Revenue Product} = \frac{20-8}{2-1} \times \$10 = \$120$ or $(\$200-\$80)/(2-1) = \$120$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

The response must show appropriate work in order to receive the point.

0	1 ✓

The response states that Schmitt Inc. will hire 4 workers and explains that Schmitt will not hire the 5th worker because the marginal revenue product of the 5th worker is $\$90$ $((54-45) \times \$10)$ which is less than the wage of $\$100$.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

The response must show appropriate work in order to receive the point.

0	1 ✓

The response calculates Schmitt's daily profit as $\$0$ and shows the work.

$\text{Profit} = (\text{TR} - \text{TC}) = (\$10 \times 45) - (\$50 + (4 \times \$100)) = \$450 - \$450 = \$0$

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1	2 ✓

The response accurately includes the two criteria below.

- ☐ States that the wage will increase.
- ☐ States that the number of workers employed by a typical firm will decrease and explains that the market supply of workers will decrease, which causes the marginal factor cost (marginal resource cost) to increase, leading to a lower quantity of workers for the typical firm where $\text{MRP} = \text{MFC}$.

Sparkle Car Wash is a profit-maximizing firm with the following production information.

Number of Workers	Number of Cars Washed per Day
0	0
1	15
2	35
3	60
4	75
5	85
6	80

a. With which worker is marginal product maximized?

b. Identify and define the economic principle that explains why marginal product eventually decreases.

c. Explain why Sparkle would never hire the sixth worker.

d. If Sparkle charges $6 for washing a car, what is the maximum daily wage that Sparkle would be willing to pay the fourth worker?

43. Respond to all parts of the question.

Part A

1 point: 3rd worker

k

0	1 ✓

Student earns 1/1 point(s)

1 point: 3rd worker

Part B

1 point: Diminishing marginal returns

1 point: Definition of diminishing marginal returns that includes both variable **and** fixed inputs

0	1	2 ✓

Student earns 2/2 point(s)

1 point: Diminishing marginal returns

1 point: Definition of diminishing marginal returns that includes both variable **and** fixed inputs

Part C

1 point: Negative marginal product for the 6th worker

Also accepted: negative returns, output falls, or MRP < 0.

0	1 ✓

Student earns 1/1 point(s)

1 point: Negative marginal product for the 6th worker

Also accepted: negative returns, output falls, or MRP < 0.

Part D

1 point: $90 (P x MP or $6 x 15 = $90)

k

0	1 ✓

Student earns 1/1 point(s)

1 point: $90 (P x MP or $6 x 15 = $90)

Assume that a firm produces output using one fixed input, capital, and one variable input, labor. The firm can sell all of the output it produces at a market price of $3 each, can hire all of the workers it wants at a market wage rate $11 each, and has fixed costs of $10. It faces the following production schedule.

Number of Employees	Total Output
0	0
1	14
2	26
3	35
4	42
5	46
6	48

a. In what kind of market structure does this firm sell its output? How can you tell?

b. In what kind of market structure does this firm hire its employees? How can you tell?

c. Using marginal revenue product analysis, how many employees should this firm hire to maximize short-run profits? How can you determine that?

d. Based on your answer in part (c), how many units of output will this firm produce?

e. At the level of output you identified in part (d), is the firm earning an economic profit, a normal profit, or suffering a loss? How can you tell?

44. Respond to all parts of the question.

Part A

1 Point

- **1 point:** Perfect competition (or pure competition) since price of output is given to the firm.

"Because the firm is a price-taker" is also acceptable.

k

0	1 ✓

The student earns all of the following points:

- **1 point:** Perfect competition (or pure competition) since price of output is given to the firm.

"Because the firm is a price-taker" is also acceptable.

Part B

1 Point

- **1 point:** Perfect competition since the wage rate is given to the firm.

"Because the firm is a price-taker" is also acceptable.

0	1 ✓

The student earns all of the following points:

- **1 point:** Perfect competition since the wage rate is given to the firm.

"Because the firm is a price-taker" is also acceptable.

Part C

2 Points

- **1 point:** for 5 workers
- **1 point:** for the explanation

The MRP>w for 5 workers but not for 6.

It is **not** sufficient to point out that the firm earns a profit (or its greater profit) at 5 workers. Some reference must be made to the fact that MRC (MRC, MC *of labor, or wages*) is closest to MRP and is still greater than MRP at that level output.

0	1	2 ✓

The student earns all of the following points:

k

- **1 point:** for 5 workers
- **1 point:** for the explanation

The MRP>w for 5 workers but not for 6.

It is **not** sufficient to point out that the firm earns a profit (or its greater profit) at 5 workers. Some reference must be made to the fact that MRC (MRC, MC *of labor, or wages*) is closest to MRP and is still greater than MRP at that level output.

Part D

1 Point

- **1 point:** 46 units of output

The output level must be consistent with the units of labor selected in part (c) may still earn the point here if the output level is consistent with that quantity of labor indicated by the student in part (c).

0	1 ✓

The student earns all of the following points:

- **1 point:** 46 units of output

The output level must be consistent with the units of labor selected in part (c) may still earn the point here if the output level is consistent with that quantity of labor indicated by the student in part (c).

Part E

1 point:

TR: $138 (46 x $3)

-TVC 55 (5 x $11)

-TFC 10

=Economic Profit $73

Must be consistent with the student's answer above.

They do not have to show the actual profit. If they state that a profit is being earned because TR > TC, they receive credit.

k

Profit Chart

Output	# Workers	Profits
0	0	–10
14	1	21
26	2	46
35	3	62
42	4	72
46	5	73
48	6	68

0	1 ✓

The student earns all of the following points:

1 Point:

TR: $138 (46 x $3)

-TVC 55 (5 x $11)

-TFC 10

=Economic Profit $73

Must be consistent with the student's answer above.

They do not have to show the actual profit. If they state that a profit is being earned because TR > TC, they receive credit.

Profit Chart

Output	# Workers	Profits
0	0	–10
14	1	21
26	2	46
35	3	62
42	4	72
46	5	73
48	6	68

k

Number of Workers	Marginal Revenue Product per Day
1	$450
2	$500
3	$450
4	$400
5	$300
6	$100

The table above gives the short-run marginal revenue product of labor per day for a perfectly competitive firm. The firm is currently selling its product at the market price of $5.

a. Calculate the marginal (physical) product of the third worker.

b. Define the law of diminishing marginal returns and explain why it occurs.

c. Diminishing marginal returns first occur with the hiring of which worker for the firm?

d. What is the highest daily wage that the firm is willing to pay to hire the fifth worker?

e. What will happen to the demand for labor if the market price of the product increases? Explain.

Respond to all parts of the question.

45.

Part A

1 point:

- One point is earned for calculating the marginal product of the third worker: $450/$5 per unit = 90 units.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for calculating the marginal product of the third worker: $450/$5 per unit = 90 units.

Part B

2 points:

- One point is earned for defining the law of diminishing returns: as more and more units of a variable input are added to a fixed input, the output increases at a decreasing rate.

k

- One point is earned for the explanation that diminishing returns occur because of the overuse of the fixed input.

0	1	2 ✓

Student receives 2/2 point(s)

2 points:

- One point is earned for defining the law of diminishing returns: as more and more units of a variable input are added to a fixed input, the output increases at a decreasing rate.
- One point is earned for the explanation that diminishing returns occur because of the overuse of the fixed input.

Part C

1 point:

- One point is earned for stating that diminishing marginal returns first occur with the hiring of the third worker.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for stating that diminishing marginal returns first occur with the hiring of the third worker.

Part D

1 point:

- One point is earned for stating $300.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for stating $300.

Part E

k

1 point:

- One point is earned for stating that the demand for labor will increase because the increase in the product price raises the marginal revenue product of labor.

0	1 ✓

Student receives 1/1 point(s)

1 point:

- One point is earned for stating that the demand for labor will increase because the increase in the product price raises the marginal revenue product of labor.

In the United States, textiles are sold in two separate and perfectly competitive markets. The textiles produced in the United States are sold in market A, and imported textiles are sold in market B.

(a) Explain how the supply curve for textiles produced in the United States will be affected by each of the following.

(i) A decrease in the number of firms in the United States producing textiles
(ii) An increase in the price of textiles

Assume that textiles produced in market A and market B are close substitutes

(b) Using one graph for market A and another for market B, show and explain how a substantial increase in the tariff on textiles imported into the United States will affect each of the following.

(i) Equilibrium price and quantity of textiles sold in market B (imported textiles)
(ii) Equilibrium price and quantity of textiles sold in market A (textiles produced in the United States)

Assume that the labor market for textile workers is perfectly competitive. Following a decrease in the supply of textile workers, the wage rate of textile workers increases.

(c) Using a new graph for market A, show and explain how a substantial increase in the wage rate of textile workers will affect the equilibrium price and quantity of textiles sold in market A.

(d) Using a graph, show and explain how the increase in the wage rate of textile workers and the change in the equilibrium price and quantity of textiles you identified in part (c) will affect each of the following.

(i) A firm's demand for labor
(ii) A firm's supply of labor

k

46. Respond to all parts of the question.

Part A

2 Points

- **1 -** for inward shift in supply; a decrease in supply
- **1 -** for movement along the supply curve; an increase in the quantity supplied or supply curve does not change

0	1	2 ✓

The student earns all of the following points:

- **1 -** for inward shift in supply; a decrease in supply
- **1 -** for movement along the supply curve; an increase in the quantity supplied or supply curve does not change

Part B

4 Points

- **1 -** for import Market B: shift inward (decrease) supply: need correct graph
- **1 -** leading to increase price and reduced quantity in market B (either in a correct graph or a verbal explanation
- **1 -** domestic Market A: shift out (increase) in demand need correct graph +verbal linkage to the price increase in Import Market B in part (b-i) below
- **1 -** leading to increased price and increased quantity in market A (either in a correct graph or a verbal explanation)

0	1	2	3	4 ✓

The student earns all of the following points:

- **1 -** for import Market B: shift inward (decrease) supply: need correct graph
- **1 -** leading to increase price and reduced quantity in market B (either in a correct graph or a verbal explanation
- **1 -** domestic Market A: shift out (increase) in demand need correct graph +verbal linkage to the price increase in Import Market B in part (b-i) below
- **1 -** leading to increased price and increased quantity in market A (either in a correct graph or a verbal

k

explanation)

Part C

1 Points

- **1 -** for supply shifts in (decrease): leading to a price increase and a decrease in quantity on a correctly labeled graph

0	1 ✓

The student earns all of the following points:

- **1 -** for supply shifts in (decrease): leading to a price increase and a decrease in quantity on a correctly labeled graph

Part D

2 Points

1 - for MRP1 shifts out due to an increase in the output price

1 - for labor supply to the firm (must be perfect elastic or horizontal) shifts up following the increase in the wage rate

0	1	2 ✓

The student earns all of the following points:

- **1 -** for MRP1 shifts out due to an increase in the output price
- **1 -** for labor supply to the firm (must be perfect elastic or horizontal) shifts up following the increase in the wage rate

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Todd's Trucking Company.

Number of Drivers	Total Product per Hour
1	8
2	18
3	30
4	50
5	60
6	65
7	67
8	65

(a) Beginning with which driver do diminishing marginal returns set in for Todd's Trucking Company? Explain using numbers.

(b) Assume Todd's Trucking Company sells its trucking services in a perfectly competitive market at a price of $6. Calculate the marginal revenue product of the third driver. Show your work.

(c) Todd's Trucking Company hires drivers in a perfectly competitive labor market for drivers at a wage rate of $40 per hour, and the market price of services remains $6. How many drivers will Todd's Trucking Company hire to maximize its profit? Explain using marginal analysis.

(d) Assume drivers must pay for a certification exam before they can work in this industry. If the cost of that exam decreases, what will happen to each of the following in equilibrium?
(i) The market wage rate. Explain.
(ii) The number of workers hired in the labor market. Explain.

47. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin with the fifth worker and explains that the marginal product (MP) of the fifth worker (10) is less than the MP of the fourth worker (20).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the third worker as $72 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$6 \times 12 = \$72$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 5 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 5^{th} worker ($60) is greater than the marginal resource cost (MRC) or wage ($40), but the MRP of the 6^{th} worker ($30) is less than the MRC ($40).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the market wage rate will decrease and explains that a decrease in the cost of the exam will lead to an increase in the supply of workers in that market.

· States that the number of workers hired in the labor market will increase and explains that the decrease in the wage rate

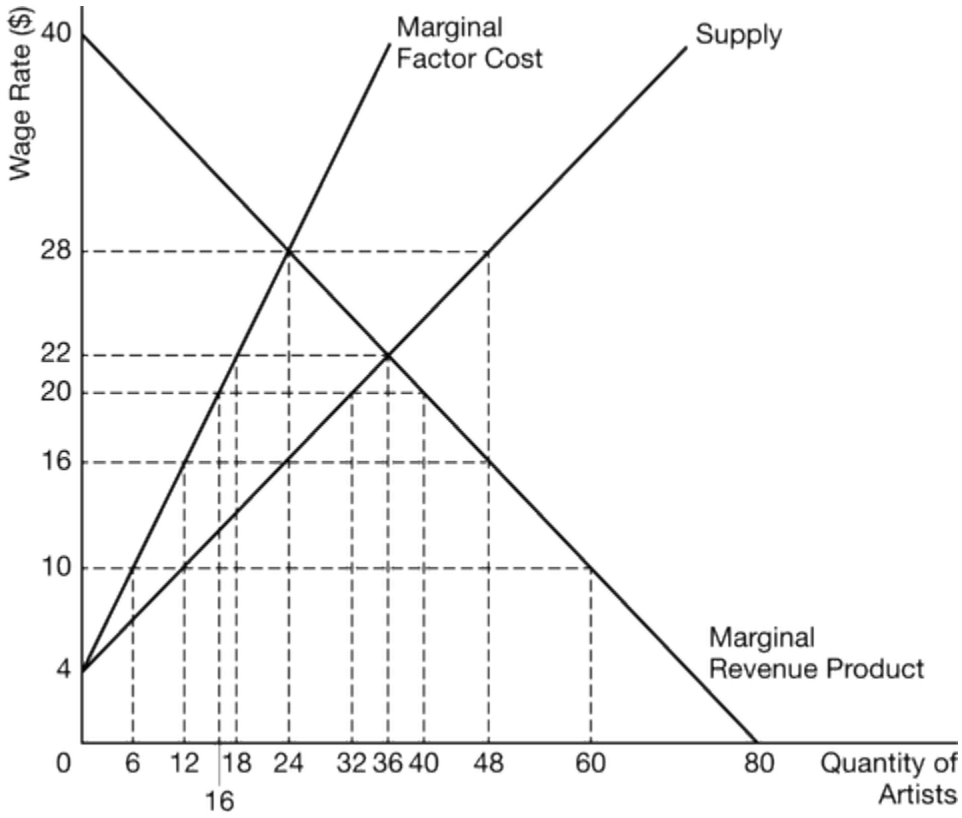
k

resulting from the increase in the supply of workers in that market will lead to more workers hired given the downward-sloping demand curve.

k

***Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clea*rly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.**

Tandy's Art is the only art studio and workshop in a small remote town, and Tandy's Art is the only employer of artists in the area. The graph below shows the market for artists with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) Identify the profit-maximizing number of artists that Tandy's Art will hire. Explain using the labeling on the graph.

(b) Identify the profit-maximizing wage rate that Tandy's Art will pay its artists. Explain using the labeling on the graph.

(c) If the wage rate is $10, state whether there will be a shortage or a surplus of artists and calculate its size. Show your work.

(d) Assume that the market for artists becomes perfectly competitive. What wage rate would Tandy's Art pay its artists if it were a perfectly competitive firm? Explain using labeling on the graph.

(e) Assume instead that Tandy's Art uses both labor and capital in its production of artwork. The marginal product of the last unit of labor hired is 90 pieces of artwork per day and the marginal product of the last unit of capital rented is 80 pieces of artwork per day; the daily wage rate for labor is $10 and the daily rental price for capital is $20. To minimize the cost of providing its current level of output, should Tandy's Art hire more artists, fewer artists, or the same number of

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artists? Explain using marginal analysis.

48. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of artists as 24 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $16 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a shortage at a wage of $10, calculates the shortage as 48 artists, and shows the work.

$$\text{Shortage} = \text{Quantity Demanded} - \text{Quantity Supplied} = 60 - 12 = 48$$

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the perfectly competitive wage would be $22 and explains that the wage would be determined by the intersection of the supply curve and the marginal revenue product curve.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should hire more artists and explains that the ratio of the marginal product of labor to the wage (9) is greater than the ratio of the marginal product of capital to the rental price of capital (4), or the firm can get more output for its money by hiring more workers and renting less capital, or

$$\frac{MP_{Labor}}{P_{Labor}} > \frac{MP_{Capital}}{P_{Capital}}$$

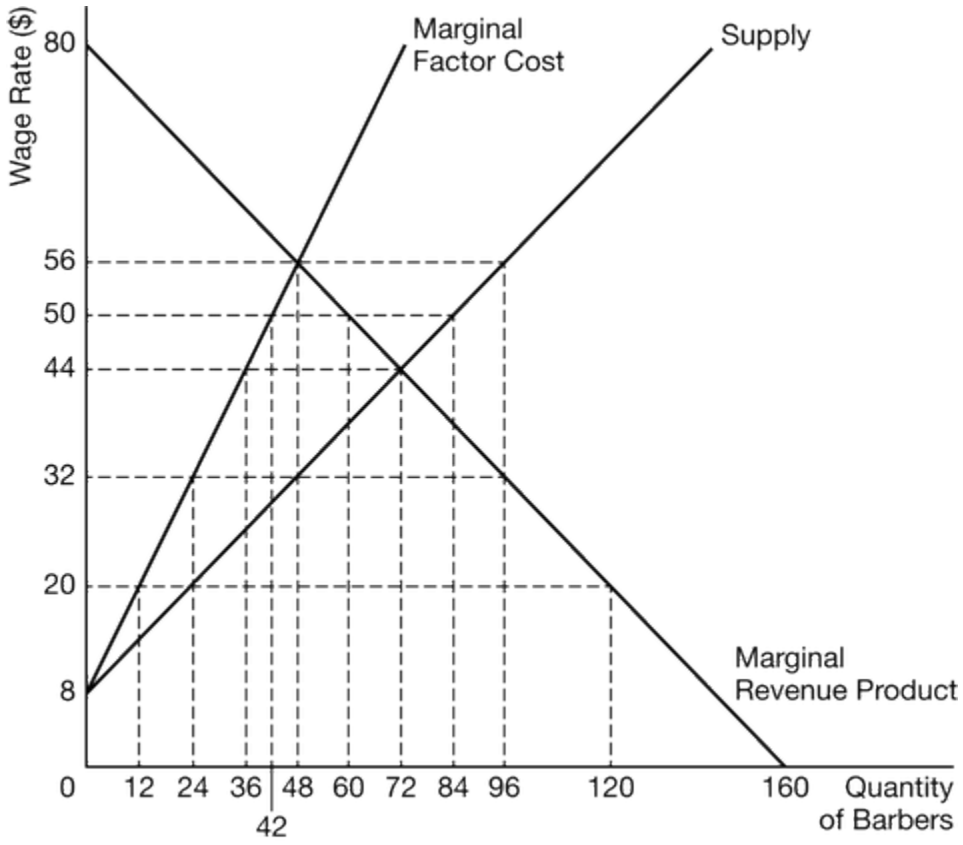
$$\frac{90}{10} > \frac{80}{20}$$

$$9 > 4$$

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Tom's Trims is the only barber shop in a small remote town, and Tom's Trims is the only employer of barbers in the area. The graph below shows the market for barbers with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) If the wage rate is $20, state whether there will be a shortage or a surplus of barbers and calculate its size. Show your work.

(b) Identify the profit-maximizing number of barbers that Tom's Trims will hire. Explain using the labeling on the graph.

(c) Identify the profit-maximizing wage rate that Tom's Trims will pay its barbers. Explain using the labeling on the graph.

(d) Assume that the market for barbers becomes perfectly competitive. What wage rate would Tom's Trims pay its barbers if it were a perfectly competitive firm? Explain using labeling on the graph.

(e) Assume instead that Tom's Trims uses both labor and capital in providing its services. The marginal product of the last unit of labor hired is 80 cuts per day and the marginal product of the last unit of capital rented is 120 cuts per day; the

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daily wage rate for labor is $20 and the daily rental price for capital is $40. To minimize the cost of producing its current level of output, should Tom's Trims hire more barbers, fewer barbers, or the same number of barbers? Explain using marginal analysis.

49. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a shortage at a wage of $20, calculates the shortage as 96 barbers, and shows the work.

$$\text{Shortage} = \text{Quantity Demanded} - \text{Quantity Supplied} = 120 - 24 = 96$$

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of barbers as 48 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $32and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the perfectly competitive wage would be $44 and explains that the wage would be determined by the intersection of the supply curve and the marginal revenue product curve.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should hire more barbers and explains that the ratio of the marginal product of labor to the wage (4) is greater than the ratio of the marginal product of capital to the rental price of capital (3), or the firm can get more output for their money by hiring more workers, or

$$\frac{MP_{Labor}}{P_{Labor}} > \frac{MP_{Capital}}{P_{Capital}}$$

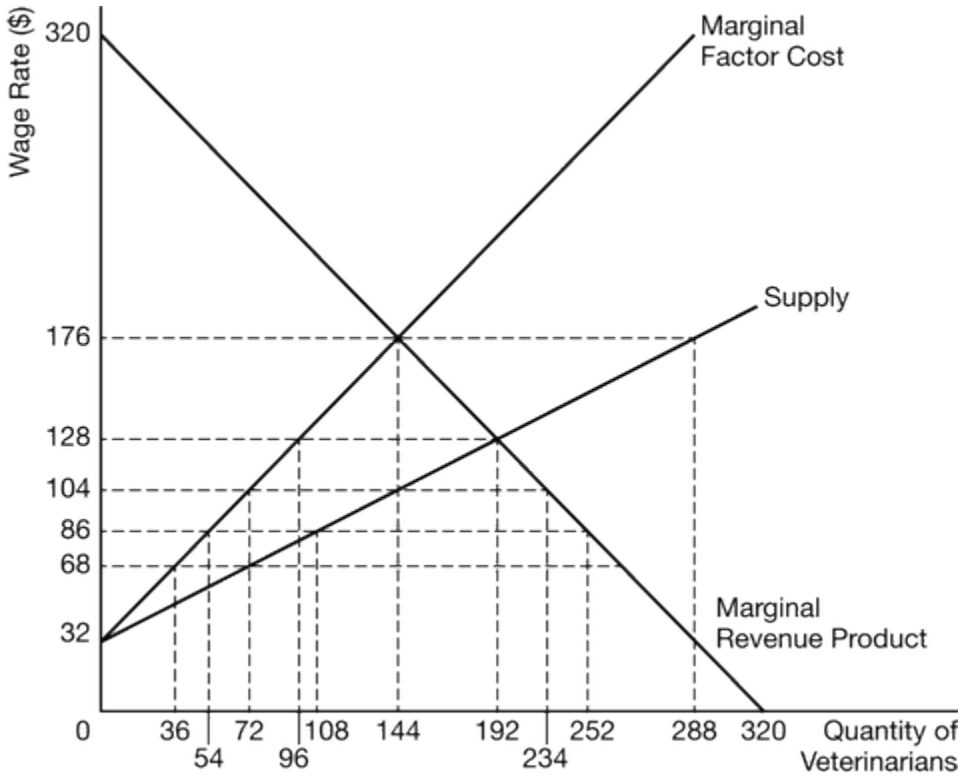
$$\frac{80}{20} > \frac{120}{40}$$

$$4 > 3$$

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

Vijay's Veterinary is the only animal care facility in a small remote town, and Vijay's Veterinary is the only employer of veterinarians in the area. The graph below shows the market for veterinarians with the marginal factor (resource) cost curve, the labor supply curve, and the marginal revenue product curve.



(a) Identify the profit-maximizing number of veterinarians that Vijay's Veterinary will hire. Explain using the labeling on the graph.

(b) Identify the profit-maximizing wage rate that Vijay's Veterinary will pay its veterinarians. Explain using the labeling on the graph.

(c) If the wage rate is $86, state whether there will be a shortage or a surplus of veterinarians and calculate its size. Show your work.

(d) If the marginal product of veterinarians decreases, what will happen to the quantity of services provided by Vijay's Veterinary? Explain.

(e) Assume instead that Vijay's Veterinary uses both labor and capital in providing its services. The marginal product of the last unit of labor hired is 50 patients per day and the marginal product of the last unit of capital rented is 10 patients per day; the daily wage rate for labor is $100 and the daily rental price for capital is $40. To minimize the cost of

k

providing its current level of service, should Vijay's Veterinary rent more capital, less capital, or the same amount of capital? Explain using marginal analysis.

50. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the profit-maximizing number of workers as 144 and explains that at that quantity, the marginal revenue product is equal to the marginal factor cost.

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response identifies the wage the firm will pay as $104 and explains that this is the wage on the supply curve at the profit-maximizing number of workers (where marginal revenue product is equal to marginal factor cost).

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that there will be a shortage at a wage of $86, calculates the shortage as 144 veterinarians, and shows the work.

$$\text{Shortage} = \text{Quantity Demanded} - \text{Quantity Supplied} = 252 - 108 = 144$$

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that the quantity of services provided will decrease and explains that as each worker's extra output (marginal product) decreases, the firm's MRP decreases, decreasing the quantity of labor hired as well as the quantity of output produced by the firm.

Part E

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that the firm should rent less capital and explains that the ratio of the marginal product of labor to the wage (0.5) is greater than the ratio of the marginal product of capital to the rental price of capital (0.25), or the firm can get more output for their money by hiring more workers and renting less capital, or

$$\frac{MP_{Labor}}{P_{Labor}} > \frac{MP_{Capital}}{P_{Capital}}$$

$$\frac{50}{100} > \frac{10}{40}$$

$$0.5 > 0.25$$

k

***Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly la*beled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.**

The table below shows the short-run production function for Zhizhi's Bakery.

Number of Bakers	Total Product per Hour
1	9
2	19
3	28
4	36
5	43
6	49
7	53
8	52

(a) After which baker do diminishing marginal returns begin for Zhizhi's Bakery? Explain using numbers.

(b) Assume Zhizhi's Bakery sells its baked goods in a perfectly competitive market at a price of $5 per unit. Calculate the marginal revenue product of the fifth baker. Show your work.

(c) Zhizhi's Bakery hires bakers in a perfectly competitive labor market for bakers at a wage rate of $36 per hour, and the market price of baked goods remains $5. How many bakers will Zhizhi's Bakery hire to maximize its profit? Explain using marginal analysis.

(d) Assume there is an increase in the demand for baked goods in the market. What will happen to each of the following?
(i) The market wage rate. Explain.
(ii) The marginal revenue product curve for Zhizhi's Bakery. Explain.

51. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

k

The response states that diminishing marginal returns begin after the second worker and explains that the marginal product (MP) of the third worker (9) is less than the MP of the second worker (10).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the fifth worker as $35 and shows the work.

$$\text{MRP} = \text{P} \times \text{MP} = \$5 \times 7 = \$35$$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 4 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 4^{th} worker ($40) is greater than the marginal resource cost (MRC) or wage ($36), but the MRP of the 5^{th} worker ($35) is less than the MRC ($36).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the market wage will increase and explains that an increase in the market demand for baked goods will lead to an increase in demand for bakers because the demand for bakers is dependent on (or derived from) the demand for baked goods.

· States that the marginal revenue product curve for the firm will shift to the right and explains that the marginal revenue product is the price of the product times the marginal product, so an increase in the demand for baked goods will increase the market price of baked goods and will therefore increase the marginal revenue product for every unit of labor.

k

Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. If the question prompts you to "Calculate," you must show how you arrived at your final answer.

The table below shows the short-run production function for Chloe's Plumbing Services.

Number of Plumbers	Total Product per Hour
1	8
2	16
3	26
4	37
5	50
6	60
7	68
8	74

(a) After which plumber do diminishing marginal returns begin for Chloe's Plumbing Services? Explain using numbers.

(b) Assume Chloe's Plumbing Services sells its plumbing services in a perfectly competitive market at a unit price of $15. Calculate the marginal revenue product of the third plumber. Show your work.

(c) Chloe's Plumbing Services hires plumbers in a perfectly competitive labor market for plumbers at a wage rate of $115 per hour, and the market price of plumbing services remains $15. How many plumbers will Chloe's Plumbing Services hire to maximize its profit? Explain using marginal analysis.

(d) Assume plumbers and plumbing equipment are substitutes in providing plumbing services by all plumbing firms in the market. If plumbing equipment, a fixed input, becomes less expensive and Chloe's Plumbing Services provides the same quantity of plumbing services, will each of the following increase, decrease, or stay the same?
(i) The wage rate Chloe's Plumbing Services will pay its plumbers. Explain.
(ii) The demand curve for plumbers for Chloe's Plumbing Services. Explain.

52. Respond to all parts of the question.

Part A

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

k

0	1 ✓

The response states that diminishing marginal returns begin after the fifth worker and explains that the marginal product (MP) of the sixth worker (10) was less than the MP of the fifth worker (13).

Part B

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response calculates the marginal revenue product of the third worker as $150 and shows the work.

$\text{MRP} = \text{P} \times \text{MP} = \$15 \times 10 = \$150$

Part C

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1 ✓

The response states that 7 workers will be hired to maximize its profit and explains that the marginal revenue product (MRP) of the 7th worker ($120) is greater than the marginal resource cost (MRC) or wage ($115), but the MRP of the 8th worker ($90) is less than the MRC ($115).

Part D

Select a point value to view scoring criteria, solutions, and/or examples and to score the response.

0	1	2 ✓

The response does both of the following:

· States that the wage rate the firm will pay will decrease and explains that a decrease in the price of plumbing equipment will result in a decrease in the demand for plumbers because plumbing equipment and workers are substitutes in providing plumbing services. A decrease in the demand for workers will decrease the market wage and therefore decrease the wage rate paid by the firm because the firm is a wage taker.

k

· States that the demand curve for plumbers by Chloe's Plumbing Services will stay the same in the short run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP), which is the price of the service times the marginal product, and in the short run there is no change in the price of the service or the marginal product.

Or states that the demand curve for plumbers by Chloe's Plumbing Services will decrease in the long run and explains that the firm's demand curve for labor is the marginal revenue product of labor (MRP) which is the price of the service times the marginal product, and a decrease in the price of an input will increase the supply of plumbing services in the market, which will decrease the market price of plumbing services, and therefore will decrease the marginal revenue product for every unit of labor.