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2022

AP CollegeBoard

AP® Microeconomics

Sample Student Responses and Scoring Commentary Set 1

Inside:

Free-Response Question 1

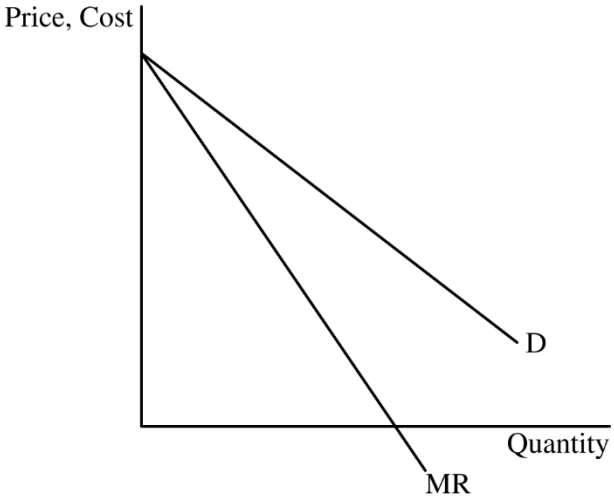
- ☑ **Scoring Guidelines**
- ☑ **Student Samples**
- ☑ **Scoring Commentary**

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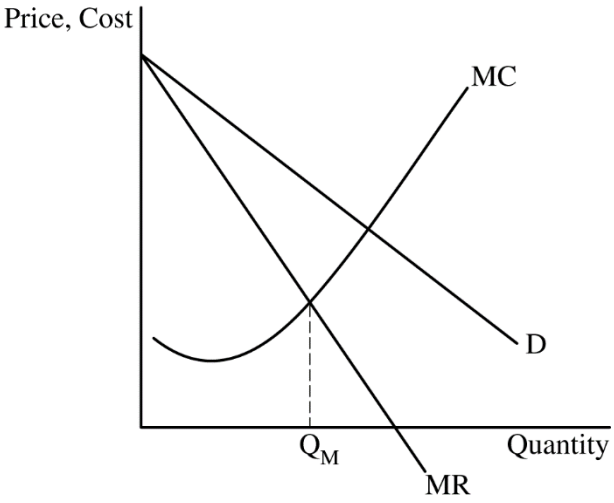
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Question 1: Long — 10 points

(a) Draw a correctly labeled graph for a monopoly showing downward-sloping demand (D) and marginal revenue (MR) curves with the MR curve below the demand curve. **1 point**

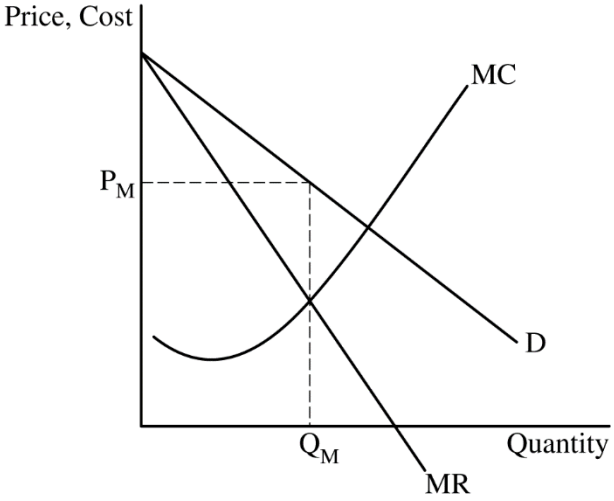


For the second point, the graph must show the marginal cost (MC) curve and the profit-maximizing quantity, labeled Q_M, where MR=MC. **1 point**

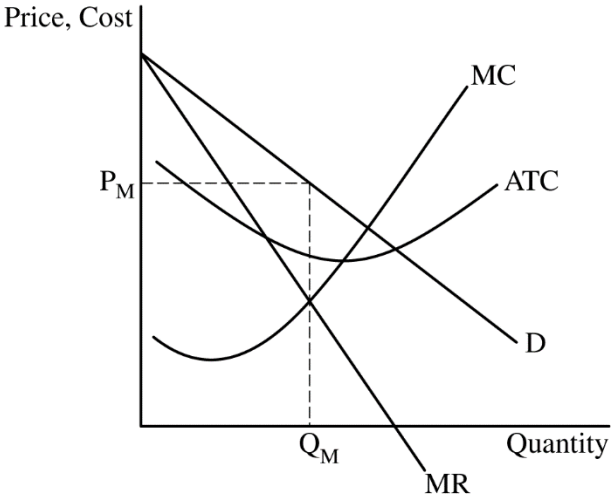


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For the third point, the graph must show the profit-maximizing price, labeled P_M, from the demand curve at Q_M. **1 point**

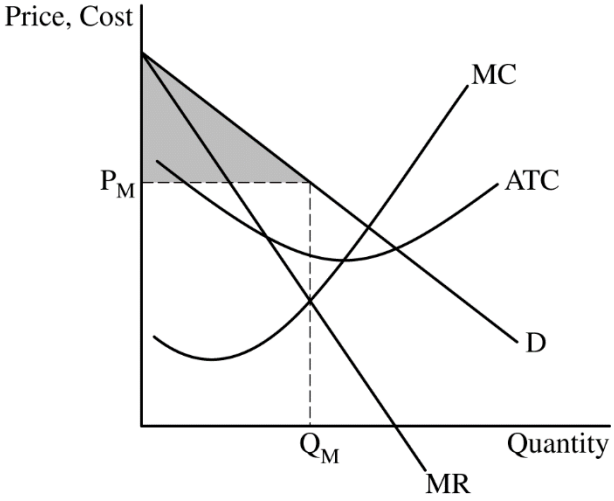


For the fourth point, the graph must show the average total cost (ATC) curve below the demand curve at Q_M and show the MC curve passing through the minimum point of the ATC curve. **1 point**

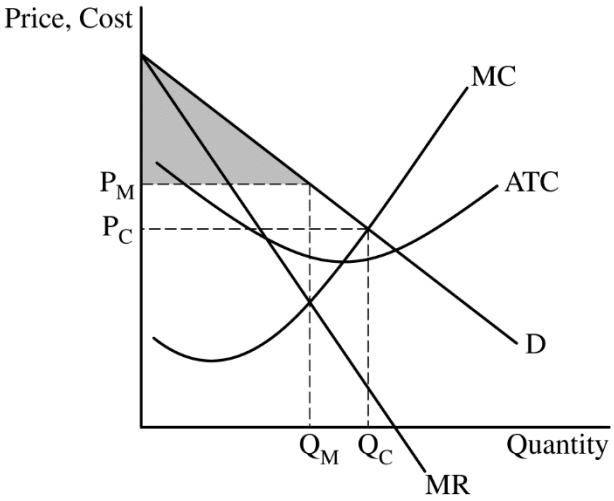


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	For the fifth point, the graph must show a completely shaded area of the consumer surplus.	**1 point**



	Total for part (a)	**5 points**
(b)(i)	State no and explain that a per-unit tax would shift the MC curve upward and intersect the MR curve at a lower quantity, which decreases the firm's profit-maximizing quantity, not increases it to the socially optimal quantity where MC=D.	**1 point**
(ii)	On your graph from part (a), show the socially optimal quantity labeled as Q_C and the price ceiling labeled as P_C at MC=D.	**1 point**



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(iii)	State that the firm is earning positive economic profit and explain that ATC is less than P_C at Q_C, as shown. **Scoring Note:** The answer should be consistent with the position of the ATC curve with respect to the demand curve at Q_C on the graph drawn in part (b)(ii). The firm will not earn positive economic profit if the ATC curve is drawn such that ATC>P_C or ATC=P_C at Q_C.	**1 point**
	Total for part (b)	**3 points**
(c) (i)	State that marginal revenue will be negative and explain that after total revenue is maximized, TR decreases since the firm moves onto the inelastic portion of the demand curve.	**1 point**
(ii)	State that the percentage increase in quantity demanded will be less than 10%.	**1 point**
	Total for part (c)	**2 points**
	Total for question 1	**10 points**

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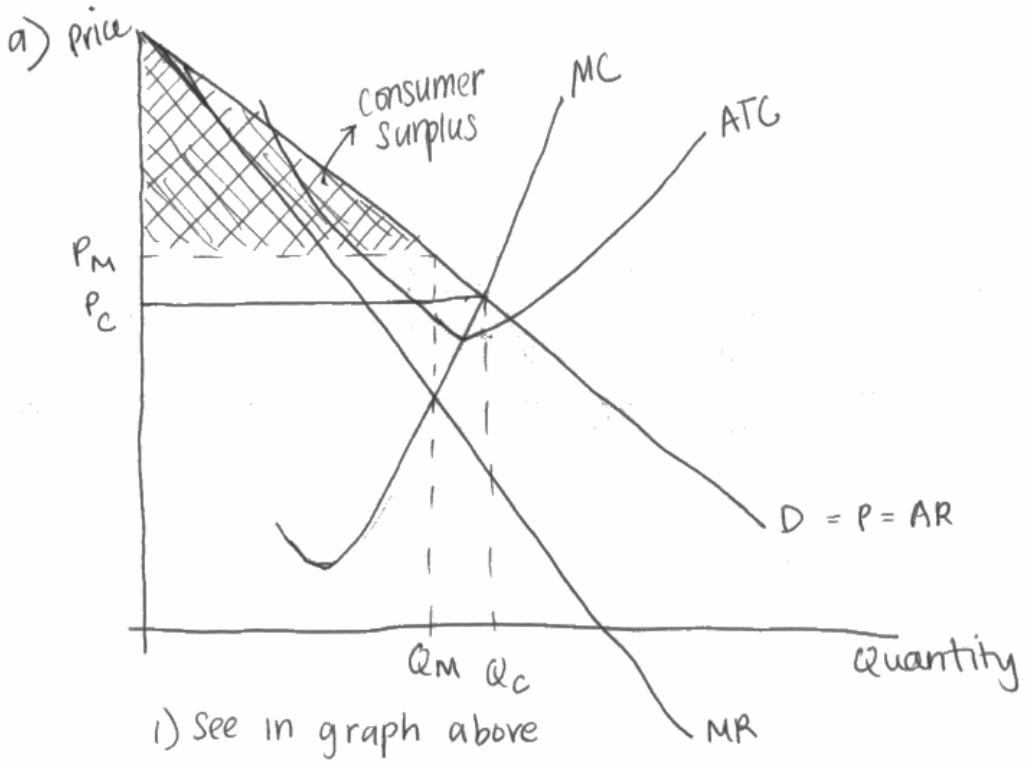
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Question 1 ● **Question 2** ○ **Question 3** ○

Begin your response to each question at the top of a new page.

1)

a)



i) See in graph above
ii) See in graph above
iii) See in graph above.

b)

i) No, a per-unit tax could not change to socially optimal quantity. A tax on the firm would shift the MC curve upward making it intersect with MR at an earlier quantity. A tax would further decrease quantity, rather than increase it towards socially optimal.

ii) See Q_C and P_C in graph in (a)

iii) the firm is still earning positive economic profit because $P_C > ATC$ at Q_C. Therefore, TR > TC at Q_C and the firm still has economic profit.

Use a pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box.

Important: Completely fill in the circle that corresponds to the question you are answering on this page.

Question 1 ● Question 2 ○ Question 3 ○

Begin your response to each question at the top of a new page.

c)

i) If the firm increases its output by 1 unit marginal revenue would be negative. The point at which total revenue is maximized is when MR = 0 because MR is downsloping. So, any additional output would produce a decrease in TR. Therefore, an additional output would be where MR is negative. since the starting quantity is where MR > 0 and MR is downsloping.

ii) Quantity demanded will increase by less than 10:1. if starting at total-revenue maximizing quantity

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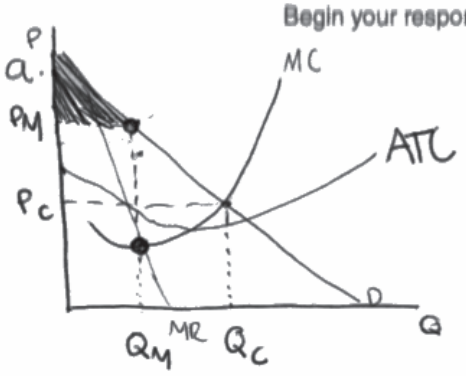
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Important: Completely fill in the circle that corresponds to the question you are answering on this page.

Question 1 ● **Question 2** ○ **Question 3** ○

Begin your response to each question at the top of a new page.

a.



b.

i) Using a per-unit tax could not change the firms output to the socially optimal quantity. Only a lump sum tax could.

ii)

iii) At this point the firm is earning economic profit because MC is above ATC.

c.

i) marginal revenue would be zero, as the firm is in ~~equilibrium~~ long run equiblium.

ii). If the firm reduced price by 10%, the quantity demanded would increase by more than 10%, due to the growth of the consumer surplus and the fact that they are the only producer.

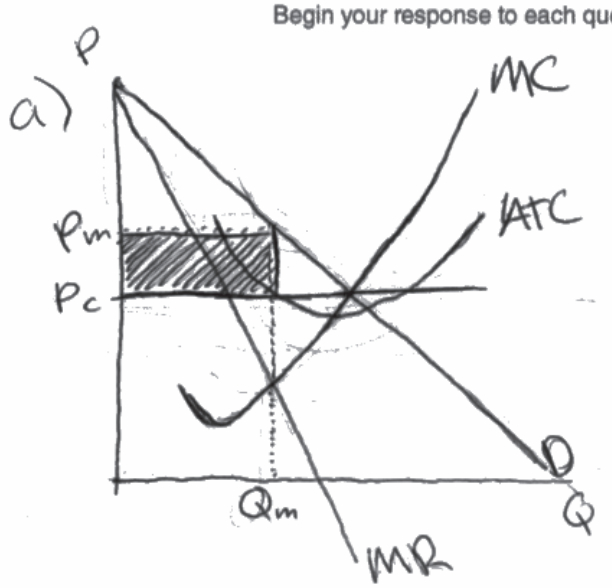
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Important: Completely fill in the circle that corresponds to the question you are answering on this page.

Question 1 ● Question 2 ✱ Question 3 ○

Begin your response to each question at the top of a new page.

a)



b) The government could use a per-unit tax i- to change the firms output because a per-unit tax shifts the marginal cost and the average total cost curve, which are the variables of the firm, and the tax would shift these cost curves back up and to the right, returning to socially optimal point.

ii- on graph

iii- At this price and quantity the firm is earning no economic profit because the ATC curve is tangent to the demand curve and Total revenue equals total cost.

c) i- The marginal revenue is positive because it is in the elastic range where MR=MC.

ii- the quantity demanded will increase.

Use a pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box.

Question 1

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Overview

The question assessed students' understanding of how a monopoly would maximize profit in the short run, whether a per-unit tax or a price ceiling would improve allocative efficiency, and the relationship between demand, marginal revenue, and price elasticity of demand.

The question stated that, "A firm has a patent on a new carbon-capture technology, making it the only producer of that device." In part (a) students were asked to draw a correctly labeled graph for a monopoly earning positive economic profit. Part (a)(i) and (a)(ii) asked students to show the profit-maximizing quantity and price, respectively. These parts of the question tested students' knowledge of market conditions for a monopoly and their ability to illustrate these concepts using a graph. This task included demonstrating knowledge of revenue and cost conditions by drawing a downward-sloping demand curve (D) and a downward-sloping marginal revenue curve (MR) that lies below the demand curve and showing the marginal cost (MC) curve. Students were asked to show that the profit-maximizing quantity (Q_M) occurs where MR equals MC and that the profit-maximizing price (P_M) is determined by identifying the price that corresponds to this quantity on the demand curve. These tasks required students to demonstrate marginal analysis in a graphical format. Students also had to draw the average total cost (ATC) curve consistent with the given positive economic profit condition by having the ATC curve below the demand curve at the profit-maximizing quantity such that the rising MC curve passes through the minimum point of the ATC curve. Part (a)(iii) asked students to completely shade the area of consumer surplus. This task required students to demonstrate understanding that consumer surplus exists as the area above price and below the market demand curve.

Part (b) of this question introduced the students to various ways of regulating the monopolist. Part (b)(i) asked whether a per-unit tax could change the firm's output to the socially optimal quantity, followed by an explanation. The students' explanation required demonstration of how a per-unit tax increases marginal cost by the MC curve shifting up (or to the left), reducing the profit-maximizing level of output, and how this would move the firm's output even further from the socially optimal outcome. Part (b)(ii) offered a price ceiling as an alternative way of inducing the socially optimal level of output. Students were asked to draw the price ceiling, P_C, in the graph such that the firm would produce the socially optimal level of output Q_C. This task required students to demonstrate that they know that the socially optimal level of output is where price (demand) equals marginal cost. Part (b)(iii) asked students to determine whether the firm was earning positive economic profit at the price and quantity identified in part (b)(ii). This task required students to demonstrate understanding that positive economic profit exists when the price exceeds average total cost.

Part (c) of this question introduced an alternative level of production. Instead of profit maximization, the firm produces the quantity of output that maximizes total revenue. Part (c)(i) asked the students whether marginal revenue would be positive, negative, or equal to zero if the firm produced one more unit of output. This task required students to know what level of output corresponds to total revenue maximization and how total revenue would change if a firm produced more than that quantity. Part (c)(ii) asked students to determine what would happen to quantity demanded if the

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Question 1 (continued)

price decreased by 10%. This task required students to demonstrate understanding that the firm would now be operating in the inelastic range of the demand curve and quantity demanded would increase by less than 10%.

Sample: 1A
Score: 10

Part (a): 5 points

The response earned the first point in part (a) because the response shows downward-sloping demand (D) and marginal revenue (MR) curves with the marginal revenue curve below the demand curve. The response earned the second point in part (a) because the response shows Q_M where MR=MC. The response earned the third point in part (a) because the response shows P_M from the demand curve at Q_M. The response earned the fourth point in part (a) because the response shows ATC below the demand curve at Q_M with the MC curve intersecting ATC at its minimum. The response earned the fifth point in part (a) for completely shading the area of consumer surplus.

Part (b): 3 points

The response earned the point in part (b)(i) for stating that the tax would not change the firm's output to the socially optimal level and for explaining that the MC curve increases and decreases the profit-maximizing quantity. The response earned the point in part (b)(ii) for showing the socially optimal quantity labeled as Qc and the price ceiling as Pc at MC=D. The response earned the point in part (b)(iii) for stating that the firm is earning positive economic profit because ATC is less than Pc at Qc.

Part (c): 2 points

The response earned the point in part (c)(i) for stating that marginal revenue will be negative and explaining that after total revenue is maximized, the next unit will cause TR to decrease because MR is downward sloping. The response earned the point in part (c)(ii) for stating that quantity demanded increases by less than 10%.

Sample: 1B
Score: 6

Part (a): 5 points

The response earned the first point in part (a) because the response shows downward-sloping demand (D) and marginal revenue (MR) curves with the marginal revenue curve below the demand curve. The response earned the second point in part (a) because the response shows Q_M where MR=MC. The response earned the third point in part (a) because the response shows P_M from the demand curve at Q_M. The response earned the fourth point in part (a) because the response shows ATC below the demand curve at Q_M with the MC curve intersecting ATC at its minimum. The

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Question 1 (continued)

response earned the fifth point in part (a) for completely shading the correct area of consumer surplus.

Part (b): 3 points

The response did not earn the point in part (b)(i) because the response does not explain that the MC curve shifts upward and the profit-maximizing quantity decreases. The response earned the point in part (b)(ii) for showing the socially optimal quantity labeled as Qc and the price ceiling as Pc at MC=D. The response did not earn the point in part (b)(iii) because the response does not state that the firm is earning positive economic profit (or "Yes") and does not correctly explain that Pc is above ATC at Qc.

Part (c): 2 points

The response did not earn the point in part (c)(i) because the response does not state that marginal revenue will be negative. The response did not earn the point in part (c)(ii) because the response does not state that the percentage increase in quantity demanded will be less than 10%.

Sample: 1C
Score: 4

Part (a): 5 points

The response earned the first point in part (a) because the response shows downward-sloping demand (D) and marginal revenue (MR) curves with the marginal revenue curve below the demand curve. The response earned the second point in part (a) because the response shows Q_M where MR=MC. The response earned the third point in part (a) because the response shows P_M from the demand curve at Q_M. The response earned the fourth point in part (a) because the response shows ATC below the demand curve at Q_M with the MC curve intersecting ATC at its minimum. The response did not earn the fifth point in part (a) because the response does not shade the correct area of consumer surplus.

Part (b): 3 points

The response did not earn the point in part (b)(i) because the response asserts that the tax would change the firm's output to the socially efficient quantity. The response did not earn the point in part (b)(ii) because the response does not show the socially optimal quantity labeled as Qc on the graph. The response did not earn the point in part (b)(iii) because the response does not make a correct comparison of Pc to ATC to explain that the firm is not making a positive economic profit.

Part (c): 2 points

The response did not earn the point in part (c)(i) because the response states that marginal revenue will be positive. The response did not earn the point in part (c)(ii) because the response does not make an assertion using one of the options provided in the question.

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