

1. Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.
- (a) Draw a correctly labeled graph for Arzeye Pharma and show each of the following.
- (i) The profit-maximizing quantity of eye treatments, labeled Q^*
 - (ii) The profit-maximizing price, labeled P^*
 - (iii) The average total cost curve consistent with positive economic profit, labeled ATC
 - (iv) The area representing consumer surplus, shaded completely
- (b) Suppose Arzeye Pharma wants to charge a price that maximizes its total revenue rather than its profit.
- (i) On your graph in part (a), show the revenue-maximizing quantity, labeled Q_R .
 - (ii) At quantity Q_R identified in part (b)(i), is the demand for eye treatments elastic, inelastic, or unit elastic?
- (c) Suppose now that Arzeye Pharma engages in perfect price discrimination.
- (i) On your graph in part (a), show the lowest price that Arzeye Pharma would charge, labeled P_2 .
 - (ii) What would happen to consumer surplus? Explain.
- (d) Suppose instead that Arzeye Pharma's patent expires. Will the demand for Arzeye Pharma's treatment become more elastic, become less elastic, or not change? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

2. The table provided shows the short-run production function for Lowen Feline, a profit-maximizing firm that produces cat food.

Number of Workers	Total Quantity of Cat Food (bags)
0	0
1	5
2	12
3	18
4	23
5	27
6	30
7	32
8	33
9	32

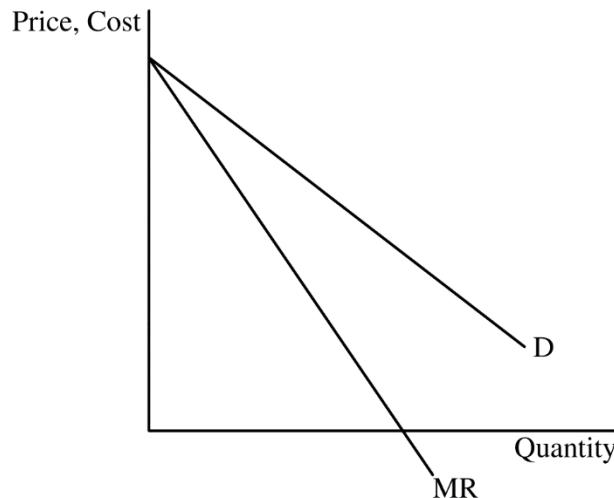
Lowen Feline sells as many bags of cat food as it wants at a market price of \$10 per bag and hires as many workers as it wants at a market wage of \$18.

- (a) Lowen Feline's fixed cost is \$90. Calculate the average fixed cost if Lowen Feline hires 6 workers. Show your work.
- (b) Assume labor is the only variable input to Lowen Feline. Calculate the marginal cost if Lowen Feline increases output from 27 to 30 units. Show your work.
- (c) With the hiring of which worker do diminishing marginal returns begin? Explain using numbers.
- (d) Determine the profit-maximizing number of workers Lowen Feline will hire. Explain using marginal analysis.
- (e) In the long run, a rival company, Gato Food, increases its production from 40 to 50 units, and its total cost increases from \$600 to \$900. Over the output range of 40 to 50 units, is Gato Food experiencing economies of scale, diseconomies of scale, or constant returns to scale? Explain using numbers.

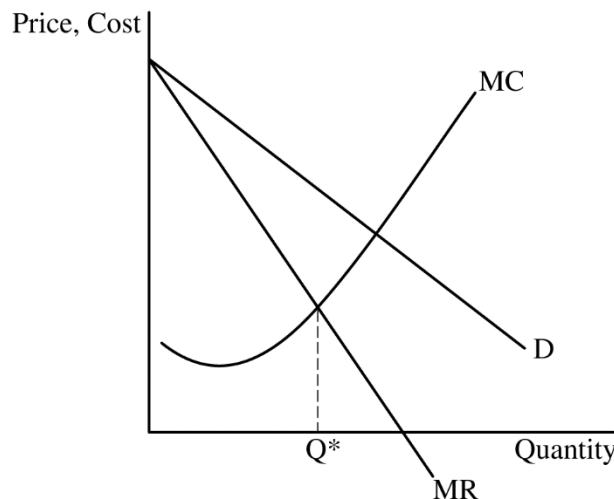
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Question 1: Long**10 points**

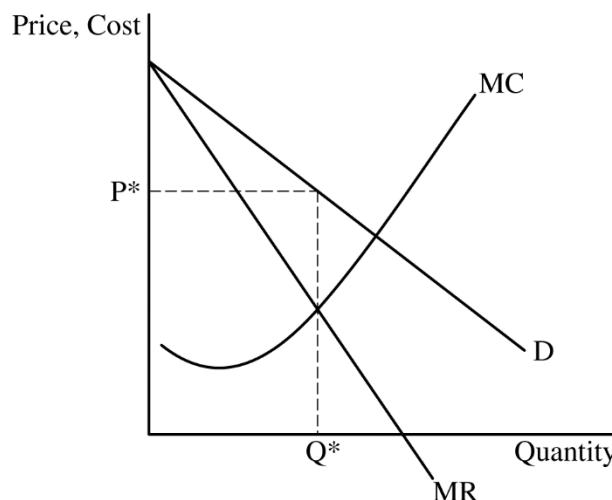
- (a) Draw a correctly labeled graph of Arzeye Pharma with a downward-sloping demand (D) curve and a downward-sloping marginal revenue (MR) curve with the MR curve below the D curve.



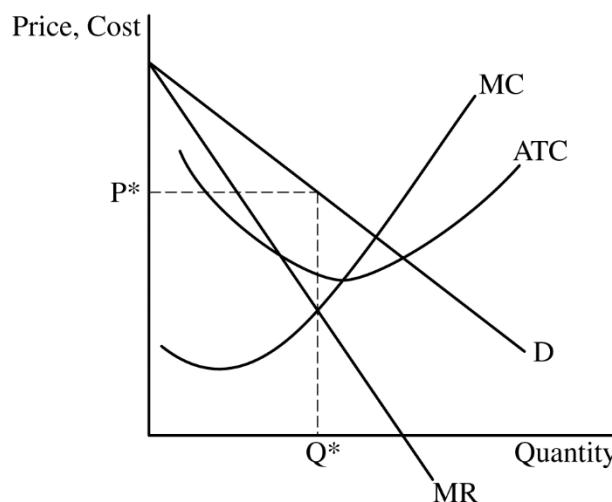
For the second point, the graph must show a rising marginal cost (MC) curve and the profit-maximizing quantity, labeled Q^* , where $MR = MC$.

1 point

For the third point, the graph must show the profit-maximizing price, labeled P^* , from the downward-sloping demand curve at Q^* . **1 point**

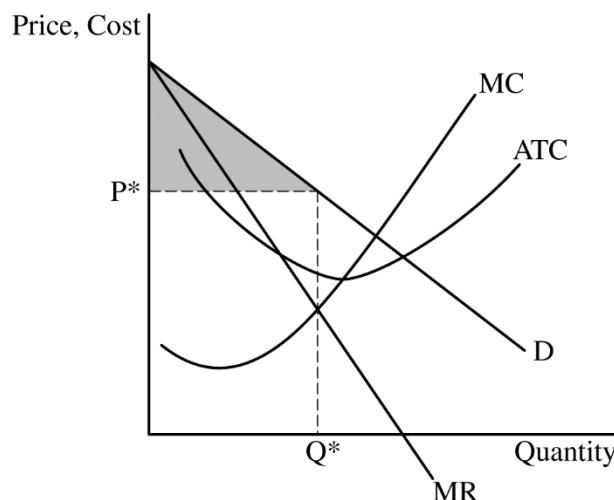


For the fourth point, the graph must show the average total cost (ATC) curve below P^* at Q^* and the marginal cost curve passing through the minimum point of the ATC curve. **1 point**



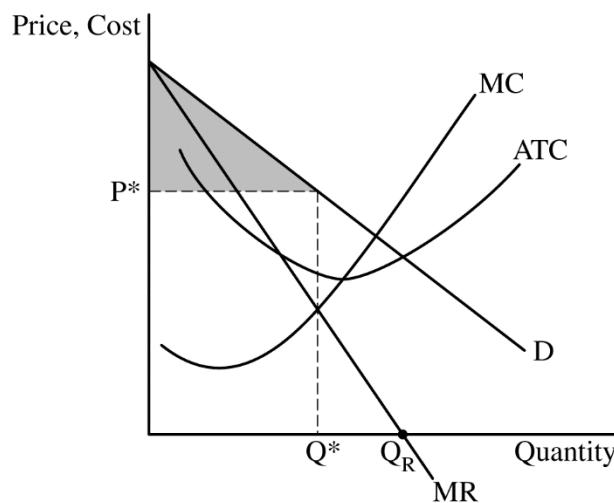
For the fifth point, the graph must show the area of consumer surplus, shaded completely.

1 point



Total for part (a) 5 points

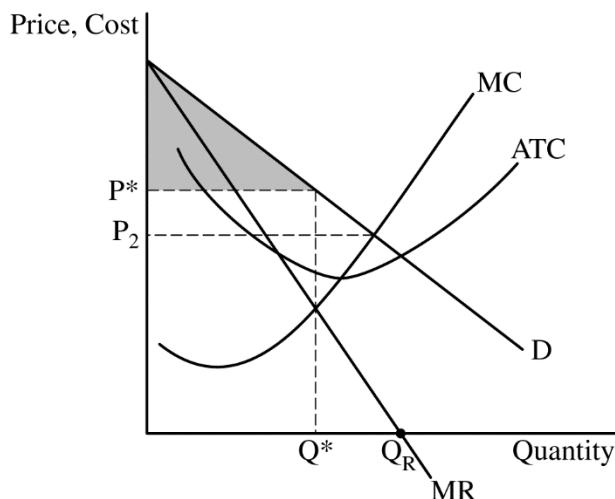
- (b) (i) The graph from part (a) must show the quantity that maximizes total revenue, labeled Q_R , where marginal revenue equals 0. **1 point**



- (ii) State that demand is unit elastic. **1 point**

Total for part (b) 2 points

- (c) (i) The graph from part (a) must show the lowest price that Arzeye Pharma would charge if it engaged in perfect price discrimination, labeled P_2 , from the intersection of the demand and marginal cost curves. **1 point**



- (ii) State that consumer surplus would decrease to \$0 and explain that Arzeye is able to charge the maximum price each consumer is willing to pay. **1 point**

Total for part (c) **2 points**

- (d) State that Arzeye Pharma's demand will become more elastic and explain that as the patent expires more firms will enter the market which increases the number and availability of substitutes, causing consumers to be more responsive to changes in the price of eye treatments. **1 point**

Total for question 1 **10 points**