

## Microeconomics: Unit III

# Cost of Production & Theory of the Firm

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1. Firms face certain types of costs that increase as output increases and other types of costs that are independent of output. These two costs respectively are

(B) variable and fixed

Variable costs increase as output increases and fixed costs are independent of output.

2. Based on the information in the table above, the total cost of producing 6 units of output is

(D) 220

Total cost is fixed cost of 100 plus variable cost of 120.

3. Based on the information in the table above, the marginal cost of producing the 3rd unit of output is

(B) 15

Marginal cost is the difference in total cost (or variable cost) at two consecutive units of output. At 2 units of output, total cost is 160, at 3 units of output, total cost is 175. Therefore the cost attributed to the production of the 3rd unit, or marginal cost, is 15.

4. Based on the information in the table above, the price of the product this firm is selling is

(B) \$40

Total revenue for three units of output is \$120. Total revenue divided by quantity is average revenue or price.  $\$120 / 3 = \$40$ .

5. Which set of cost curves in the graphs above are correctly drawn?

(E) Only graph E has all of the correct relationships among the curves.

Marginal cost must intersect average total cost and average variable cost at their minimum points. Average fixed costs declines throughout the range of output. Average total cost is comprised of average fixed cost and average variable cost added together.

6. A typical marginal cost curve for a firm rises because

(C) A decrease in marginal product causes an increase in marginal cost

Marginal product is the driving force behind marginal cost.

7. The firm depicted in the graph above is

(B) a perfectly price discriminating monopoly

Only for a perfectly price discriminating monopoly are the downward sloping marginal revenue and average revenue curves the same because the perfectly price discriminating monopolist charges each successive customer the price they are willing to pay, unlike a single price monopolist which lowers the price for not just that unit, but all previous units.

8. Based on the information in the payoff matrix box depicted above, what can be concluded?

(A) Jim and Julie will each charge a lower price

Both Jim and Julie have a dominant strategy. It is best for both Jim and Julie to charge a low price regardless of what the other does.

9. Based on the information in the payoff matrix box depicted above, what can be concluded?

(B) Jim and Julie both have a dominant strategy

See explanation for question 8.

10. The three basic forms of business organization are

(C) proprietorship, partnership, corporation

Businesses are organized as either proprietorships, partnerships, or corporations. Monopoly is a market structure not a form of business organization.

11. Firms in all market structures seek to

(D) maximize profits

Profit maximization is the goal of all firms regardless of market structure.

12. If fixed costs for a firm operating under conditions of perfect competition increased, but not enough to lead the firm to shut down, how would that change in fixed cost affect each of the following?

(B) no change, decrease, no change

Changing fixed cost does not change marginal cost. If marginal cost and marginal revenue do not change, then the intersection of marginal cost and marginal revenue will not change. Without a change in marginal cost or marginal revenue, the output and price would not change. An increase in fixed cost will increase total cost and therefore lower profit. Perfectly competitive firms are price takers and cannot determine the price, so the price will not change.

13. The graph above depicts a firm facing which combination of events?

(E) negative, firms exiting the market in the long run

The price is below average total cost which means the firm is losing money. The price is above average variable cost so the firm will remain open in the short run. When firms in an industry are experiencing economic losses some of those firms will exit the market, driven away by those losses.

14. Marginal cost can be calculated by

(B) subtracting total costs at two consecutive units of output

Marginal cost is defined as the additional cost of producing one more unit. It can be calculated by subtracting the total cost (or variable cost) at two consecutive units of output.

15. Which of the following sets correctly ranks markets structures from most competitive to least competitive?

(E) perfect competition, monopolistic competition, oligopoly, monopoly

Only choice E correctly ranks market structure from most to least competitive.

16. Which of the following are necessary for a firm to be able to price discriminate?

(E) I, II, and III

In order for a firm to be able to price discriminate the firm must have monopoly power, they must be able to prevent resale, and they must be able to segregate or subdivide the market.

17. Based on the graph above the monopoly price, break-even price, and socially optimum price are respectively,

(E) B, C, E

The monopoly price is determined from  $MC = MR$  up to the demand curve, that is B. The break even price is where  $AR = ATC$ , which occurs at C. The socially optimal price is where  $MC = \text{price (or AR)}$  which occurs at E.

18. The information in the table above is representative of a firm with

(A) diminishing returns to labor and constant returns to scale

Doubling and tripling the amount of labor or capital does not result in a doubling or tripling in output. This is a demonstration of the law of diminishing returns. Doubling or tripling both labor and capital results in a doubling and a tripling of output. This is a demonstration of constant returns to scale.

19. Which of the following is true for both a perfect competitor and a monopolistic competitor in long-run equilibrium?

(A) They produce an output where they earn normal profits.

Both perfectly competitive firms and monopolistically competitive firms break-even in the long-run. Only the perfectly competitive firm is efficient at that long-run position. The monopolistically competitive firms does not operate at minimum ATC, allocative, or productive efficient levels of output.

20. Which of the following is true on the basis of the table above?

(A) Karen has a dominant strategy but Lauren does not

It is best for Karen to pursue Plan A regardless of what Lauren does: therefore, Karen has a dominant strategy. Lauren would be better off with Plan A if Karen pursues Plan A but Lauren would be better off with Plan B if Karen pursues Plan B. Therefore, Karen has a dominant strategy: she should pursue Plan A regardless of which plan Lauren pursues. Lauren does not have a dominant strategy. She would benefit from different plans depending on what Karen does.

21. What area in the graph above describes total revenue?

(B) F, Z, 2, 0

Total revenue is calculated by multiplying average revenue times quantity. At the profit maximizing level of output which is found at  $MC = MR$ , of 2, the price is derived by tracing that output up to the average revenue curve at point Z, then across to the price axis at point F. The total revenue of price times quantity, or F times 2 is described by the area F, Z, 2, 0.

22. What area in the graph above describes total cost?

(D) B, T, 2, 0

Total cost is calculated by multiplying average total cost times quantity. At the profit maximizing level of output of 2, average total cost is obtained at point T by tracing that over to the cost axis at point B. B times 2 is described by the area B, T, 2, 0.

23. What area in the graph above represents profit or loss?

(E) a profit of F, Z, T, B

Profit (or loss) is determined by comparing total revenue and total cost. In this case total revenue is larger, so this results in a profit. Question 21 demonstrated how to arrive at total revenue, Question 22 described how to arrive at total cost. If total cost is subtracted from total revenue the result is the area described by F, Z, T, B.

24. At what quantity in the graph above are average total costs minimized?

(D) J

Average costs are minimized at the minimum point on the ATC curve. This can be found where the ATC curve intersects with the MC curve. In this case that occurs at a level of output of J.

25. Based on the information in the graph above, total fixed cost is equal to

(E) E, N, S, C

Total fixed cost is calculated by multiplying average fixed cost times quantity of output. Average fixed cost is the difference between average total cost and average variable cost. In this case that amount is equal to the distance between N and S. Since we know the quantity is equal to the distance from 0 to K, the product of those two amounts is represented by the area E, N, S, C.

26. Based on the information in the graph above, the area of consumer surplus is represented by the area

(B) D, E, C

Consumer surplus is the area above the price and below the demand curve, in this case the area D, E, C.

27. Based on the information in the graph above, the amount of profit is represented by the area

(D) C, E, L, A

Profit is total revenue minus total cost. Total revenue is price times quantity, in this case C times K, or the area C, E, K, 0. Total cost is AC times quantity, in this case A times K, or the area A, L, K, 0. The difference between these two areas is C, E, L, A.

28. Based on the information in the graph above, the amount of deadweight loss due to monopoly is represented by the area

(D) E, G, L

Deadweight loss due to monopoly is the amount that does not accrue to either consumers in the form of consumer surplus or the producer in the form of profit as compared to the perfectly competitive solution. The perfectly competitive solution would be where  $MC = P$  (or demand); in this case point G. This would result in a consumer surplus of D, G, A. The monopoly solution is point L where  $MC = MR$ . The new consumer surplus is D, E, C, and the profit to the monopolist is C, E, L, A. The sum of consumer surplus and monopoly profit is smaller than the competitive consumer surplus by an amount equal to E, G, L.

29. Based on the information in the graph above, which of the following is correct?

(A) graph A is for the market and graph B is for the firm

Graph A shows supply and demand for the market, graph B shows cost and revenue curves for the firm.

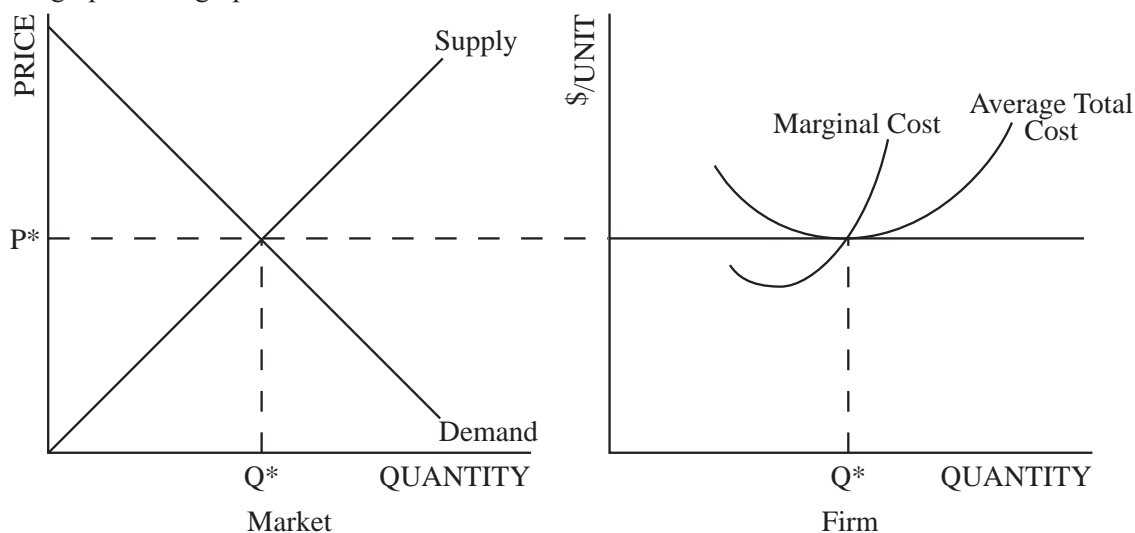
30. Based on the information in the graph above, which of the following is correct?

(A) firms will enter the market and drive the price down

Graph B shows firms making economic profits. This will result in new firms entering the market, attracted by those economic profits. As new firms enter the market, the supply will increase, driving the price down.

# Rubrics

1. Demonstrate the long-run equilibrium for a perfectly competitive firm using correctly labeled side-by-side graphs. See graph below.

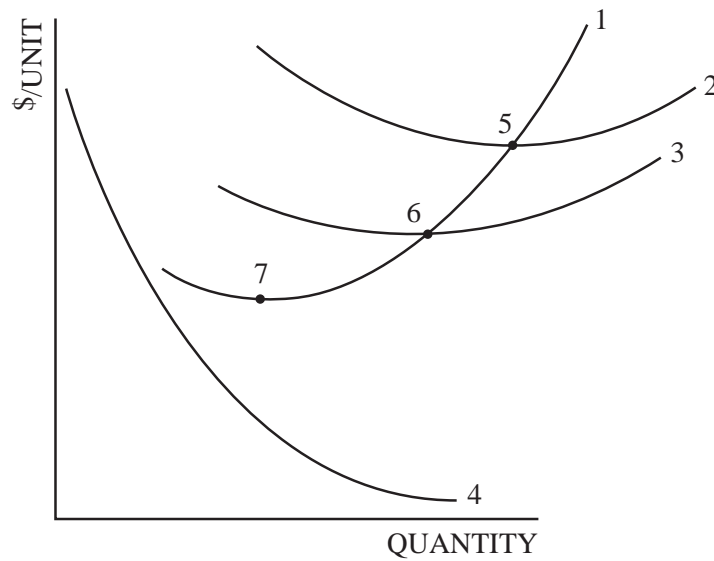


- (a) If only this firm discovers a technological breakthrough that lowers the variable cost of production what will happen to the following?
- the price charged by the firm *The price charged will remain the same as price is determined by the market and not the firm.*
  - the quantity produced by the firm *The quantity produced will increase as costs are lowered and revenue remains the same, shifting the  $MC = MR$  intersection to a new, higher level of output.*
  - the profit of the firm *Profits will increase as cost per unit is lowered and revenue per unit remains the same.*
- (b) What will happen to each of the following if, in the long run, all of the firms in the industry adopt the new technology?
- the price charged by the firm *As new firms will enter the industry because of the economic profit, this will increase supply in the market and drive the price down.*
  - the quantity produced by the firm *The equilibrium quantity will increase as supply has increased.*
  - the profit of the firm *Profits of individual firms will return to normal (zero) as a new long-run equilibrium is established.*

Now assume that the product becomes more popular with consumers:

- (c) What will happen to the price and output in the market in the short run? *The price and quantity will increase as demand for the product increases, establishing a new equilibrium.*
- (d) How will this affect a typical firm? *Firms will experience short-run economic profits.*
- (e) What will be the long-run effect on price and output in this market? Explain why. *New firms will enter the market in the long run and decrease the price as supply increases, re-establishing a long-run equilibrium for firms at which they earn normal (zero) profits.*

2.



- (a) On the graph above correctly identify curves 1, 2, 3, and 4. *curve 1 is marginal cost, curve 2 is average total cost, curve 3 is average variable cost, and curve 4 is average fixed cost.*
- (b) Identify the market structure in which this firm is operating. *It is not possible to determine market structure from cost information only.*
- (c) If this firm is operating in a perfectly competitive market, identify a price that could exist only in short-run equilibrium. *Any price above point 6 on the graph could exist in the short-run as this would maximize profits (minimize losses). If price falls below minimum average variable cost, the firm will minimize losses in the short run by shutting down.*
- (d) If this firm is operating in a perfectly competitive market, identify a price that could exist only in long-run equilibrium. *The only price that could exist in the long-run is at point 5, as this is the break-even or normal-profit price.*

3.

Karen's Pricing Strategy

		High	Low
Lauren's Pricing Strategy	High	<p style="text-align: center;">Karen Profits \$100</p> <p style="text-align: center;">Lauren Profits \$100</p>	<p style="text-align: center;">Karen Profits \$150</p> <p style="text-align: center;">Lauren Profits \$50</p>
	Low	<p style="text-align: center;">Karen Profits \$50</p> <p style="text-align: center;">Lauren Profits \$150</p>	<p style="text-align: center;">Karen Profits \$75</p> <p style="text-align: center;">Lauren Profits \$75</p>

Karen and Lauren are two competing firms in a market where there are few competitors, selling a slightly differentiated product, with significant barriers to entry. Based on this and the information in the payoff matrix above answer each of the following:

- (a) In what market structure do Karen and Lauren operate? *Oligopoly*
- (b) What pricing strategy will prevail in this market? Explain how you arrived at that outcome. *Karen and Lauren will both pursue a low price strategy. This is the Nash equilibrium. Each will maximize profits by choosing a lower price strategy over a higher price strategy at each pricing combination.*
- (c) Does Karen have a dominant strategy? Explain. *Karen has a dominant strategy as her best strategy is a low price regardless of what strategy Lauren pursues.*
- (d) Does Lauren have a dominant strategy? Explain. *Lauren has a dominant strategy as her best strategy is a low price regardless of what strategy Karen pursues.*
- (e) If Karen and Lauren could agree to a binding, collusive agreement, what pricing strategy would prevail in this market? *They would both pursue a high price strategy as this would result in the largest profit for both firms.*