

Name _____

Group _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Consider the following statements when answering this question. 1) _____
- I. Increases in the rate of income tax decrease the opportunity cost of attending college.
- II. The introduction of distance learning, which enables students to watch lectures at home, decreases the opportunity cost of attending college.
- A) I and II are both false. B) I is true, and II is false.
- C) I and II are both true. D) I is false, and II is true.

Scenario 1:

The average total cost to produce 100 cookies is \$0.25 per cookie. The marginal cost is constant at \$0.10 for all cookies produced.

- 2) Refer to Scenario 1. Which piece of information would NOT be helpful in calculating the marginal cost of the 75th unit of output? 2) _____
- A) The variable cost of 74 units.
- B) The total cost of 74 units.
- C) The variable cost of 75 units.
- D) The total cost of 75 units.
- E) The firm's fixed cost.
- 3) Which of the following statements correctly uses the concept of opportunity cost in decision making? 3) _____
- I. "Because my secretary's time has already been paid for, my cost of taking on an additional project is lower than it otherwise would be."
- II. "Since NASA is running under budget this year, the cost of another space shuttle launch is lower than it otherwise would be."
- A) I is true, and II is false. B) I and II are both true.
- C) I and II are both false. D) I is false, and II is true.
- 4) Consider the following statements when answering this question 4) _____
- I. If a firm employs only one variable factor of production, labor, and the marginal product of labor is constant, then the marginal costs of production are constant too.
- II. If a firm employs only one variable factor of production, labor, and the marginal product of labor is constant, then short-run average total costs cannot rise as output rises.
- A) I is false, and II is true. B) I is true, and II is false.
- C) I and II are both false. D) I and II are both true.

- 5) Use the following two statements to answer this question: 5) _____
- I. The average cost curve and the average variable cost curve reach their minima at the same level of output.
- II. The average cost curve and the marginal cost curve reach their minima at the same level of output.
- A) Both I and II are true. B) Both I and II are false.
- C) I is false, and II is true. D) I is true, and II is false.

- 6) Which always increase(s) as output increases? 6) _____
- A) Variable Cost only
- B) Total Cost and Variable Cost
- C) Fixed Cost only
- D) Total Cost only
- E) Marginal Cost only

- 7) Consider the following statements when answering this question. 7) _____
- I. With convex isoquants, a firm's expansion path cannot be negatively sloped.
- II. If a firm uses only two factors of production, one of whose marginal product becomes negative when its use exceeds a certain level, then a cost-minimizing firm's expansion path will have vertical or horizontal segments.
- A) Both I and II are true. B) Both I and II are false.
- C) I is true, and II is false. D) I is false, and II is true.

- 8) When an isocost line is just tangent to an isoquant, we know that 8) _____
- A) the two products are being produced at the highest input cost to the firm.
- B) output is not being produced at minimum cost.
- C) the two products are being produced at the least input cost to the firm.
- D) output is being produced at minimum cost.

- 9) The total cost of producing a given level of output is 9) _____
- A) minimized when the marginal products of all inputs are equal.
- B) minimized when marginal product multiplied by input price is equal for all inputs.
- C) maximized when a corner solution exists.
- D) minimized when the ratio of marginal product to input price is equal for all inputs.

- 10) The cost-output elasticity equals 1.4. This implies that: 10) _____
- A) marginal cost is less than average cost.
 B) there are diseconomies of scale.
 C) there are neither economies nor diseconomies of scale.
 D) there are economies of scale.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

- 11) Homer's boat manufacturing plant leases 50 hydraulic lifts and produces 25 boats per period. Homer's short-run cost function is: $C(q, K) = 15\frac{q^5}{K^{5/2}} + 200K$, where q is the number of boats produced and K is the number of hydraulic lifts. Homer's long-run cost function is: $C_{LR}(q) = 173.5578q^{10/7}$. At Homer's current short-run plant size, calculate Homer's short-run average total cost of production. If Homer would lease 11 more hydraulic lifts in the short run, will his short-run average total cost of producing 25 boats increase or decrease? Does Homer's long-run cost function exhibit increasing, constant, or decreasing returns to scale?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 12) The cost-output elasticity is used to measure: 12) _____
- A) economies of scale. B) the curvature in the fixed cost curve.
 C) economies of scope. D) steepness of the production function.
- 13) Consider the following statements when answering this question. 13) _____
- I. A technology with increasing returns to scale will generate a long-run average cost curve that has economies of scale.
 II. Diminishing returns determines the slope of the short-run marginal cost curve, whereas returns to scale determine the slope of the long-run marginal cost curve.
- A) I is false, and II is true. B) I is true, and II is false.
 C) Both I and II are false. D) Both I and II are true.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

- 14) Apu leases 2 squishy machines to produce 40 squishies in the short run. Apu's short-run cost function is: $C(q, K) = 0.85\frac{q^2}{K^2} + 0.5K$, where q is the number of squishies produced and K is the number of squishy machines used. Apu's long-run cost function is: $C_{LR}(q) = 1.13q^{2/3}$. If Apu decides to lease 7 squishy machines, what happens to Apu's short-run average total cost of producing 40 squishies? Does Apu's long-run cost function exhibit increasing, constant, or decreasing returns to scale?

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 15) When a product transformation curve for a firm is bowed inward, there are _____ in production. 15) _____
- A) economies of scale B) diseconomies of scale
 C) economies of scope D) diseconomies of scope
- 16) Economies of scope refer to 16) _____
- A) changes in technology.
 B) multiproduct firms.
 C) short-run economies of scale.
 D) single product firms that utilize multiple plants.
 E) the very long run.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

- 17) Estimates of the industry longrun average cost of producing a type of plastic hook were made in 1970 and again in 1985. Estimates of these relationships are presented as:
- $$LAC_{70} = 10 - 0.3Q + 0.05Q^2$$
- $$LAC_{85} = 8 - 0.6Q + 0.04Q^2,$$
- where Q is output in hundreds of cases per day, and LAC is average cost in dollars per unit. Assume that costs are expressed in inflation adjusted or constant dollars. From the information available, can you learn anything about economies of scope, economies of scale, and a learning curve in this industry? Explain. Do these curves reveal anything about the state of technology in this industry? Explain.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 18) A group of friends recently started manufacturing specialty T-shirts. The business has grown rapidly, with monthly production up from 50 to 250 in the first 6 months. During this same period, average production cost has been cut in half. The firm's long-run average cost curve over this range of output 18) _____
- A) is horizontal. B) is upward sloping.
 C) is downward sloping. D) may be any of the above.
- 19) A variable cost function of the form: $VC = 23 + Q + 7Q^2$ implies a marginal cost curve that is 19) _____
- A) downward sloping. B) linear.
 C) quadratic. D) U-shaped.
- 20) A cubic cost function implies: 20) _____
- A) a U-shaped average cost curve. B) a U-shaped average variable cost curve.
 C) a U-shaped marginal cost curve. D) all of the above.

- 21) Which of the following is true of cost curves? 21) _____
- A) The MC curve goes through the minimum of both the AVC curve and the ATC curve.
 - B) The MC curve goes through the minimum of the AVC curve, to the right of the minimum of the ATC curve.
 - C) The AVC curve goes through the minimum of the MC curve.
 - D) The ATC curve goes through the minimum of the MC curve.
 - E) The MC curve goes through the minimum of the ATC curve, to the left of the minimum of the AVC curve.

Scenario 3:

Use the production function: $Q = 4L^{1/2}K^{1/2}$.

- 22) Refer to Scenario 3. When $Q = 200$, what is the marginal cost? 22) _____
- A) 5
 - B) 10
 - C) 0
 - D) 25
 - E) 15
- 23) Refer to Scenario 3. Which of the following combinations of inputs is on the isoquant to produce 400 units of output? 23) _____
- A) $L = 100, K = 100$
 - B) $L = 400, K = 0$
 - C) $L = 0, K = 400$
 - D) all of the above
 - E) A and B, but not C
- 24) Refer to Scenario 3. What is the total cost of producing 200 units of output? 24) _____
- A) 1500
 - B) 100
 - C) 1000
 - D) 2000
 - E) none of the above

Scenario 2:

The production function for earthquake detectors (Q) is given as follows:

$$Q = 4K^{1/2}L^{1/2}$$

where K is the amount of capital employed and L is the amount of labor employed. The price of capital, P_K , is \$18 and the price of labor, P_L , is \$2.

- 25) Refer to Scenario 2. Suppose that you receive an order for 60 earthquake detectors. How much labor will you use to minimize the cost of 60 earthquake detectors? 25) _____
- A) 10
 - B) 45
 - C) 5
 - D) 1
 - E) none of the above

Answer Key

Testname: TEST 4 - THE COST

- 1) C
- 2) E
- 3) C
- 4) D
- 5) B
- 6) B
- 7) A
- 8) D
- 9) D
- 10) B

11) At Homer's current short-run plant size, Homer's short-run average total cost of production is:

$$ATC(25, 50) = \frac{\left(\frac{15(25)^5}{(50)^{5/2}} + 200(50) \right)}{25} = 731.46. \text{ If Homer leases an additional 11 hydraulic lifts, short-run average total}$$

$$\text{costs become: } ATC(25, 61) = \frac{\left(\frac{15(25)^5}{(61)^{5/2}} + 200(61) \right)}{25} = 689.62. \text{ We see that Homer's short-run average total costs decrease}$$

if he uses 11 additional hydraulic lifts. Homer's long-run average costs are:

$$AC_{LR}(q) = \frac{C_{LR}(q)}{q} = \frac{173.5578q^{10/7}}{q} = 173.5578q^{3/7}. \text{ Since long-run average costs increase as output increases,}$$

Homer's production process has decreasing returns to scale.

- 12) A
- 13) D

14) With 2 squishy machines, Apu's short-run average total costs are:

$$SRATC(40, 2) = \frac{\left(0.85 \frac{(40)^2}{(2)^2} + 0.5(2) \right)}{40} = 8.525. \text{ If Apu leases 7 squishy machines, his short-run average total costs}$$

$$\text{become: } SRATC(40, 7) = \frac{\left(0.85 \frac{(40)^2}{(7)^2} + 0.5(7) \right)}{40} = 0.78. \text{ Leasing 5 additional squishy machines lowers Apu's short-run}$$

$$\text{average total cost by 91%. Apu's long-run average cost curve is: } LRAC(q) = \frac{1.13q^{2/3}}{q^{1/3}}. \text{ Since Apu's long-run average}$$

costs decrease as output increases, Apu's cost curve exhibit increasing returns to scale.

- 15) D
- 16) B

Answer Key

Testname: TEST 4 - THE COST

17) Nothing can be learned about economies of scope, given that only one product is being produced. We can get some idea about technology by calculating the output rate that produces a minimum LAC. For the two points in time, the minimum LAC is calculated as follows:

For 1970:

$$LAC'_{70} = -0.3 + 0.1Q = 0$$

$$Q = 3.0 \text{ (in hundreds of cases)}$$

For 1985:

$$LAC'_{85} = -0.6 + 0.08Q = 0$$

$$Q = 7.5 \text{ (in hundreds of cases)}$$

The LAC₇₀ at Q = 3 is $10 - 0.3(3) + 0.05(3)^2 = \$9.55/\text{case}$.

The LAC₈₅ at Q = 7.5 is $8 - 0.6(7.5) + 0.04(7.5)^2 = \$5.75/\text{case}$.

We see that LAC is minimized at positive levels of Q in 1970 and in 1985. Also, we see that LAC is minimized at a higher level of output in 1985 than in 1970. Over time the rate of production in the industry that represented the optimum scale of plant increased. The fact that LAC decreased time for various levels of output (LAC₇₀ vs. LAC₈₅) indicates that technology changed (improved) and/or that there was a learning process in progress (learning curve). The data given do not allow one to separate the two effects. Since both LAC functions have minimums, economies of scale are evident. Economies occur to Q = 3 (1970) and Q = 7.5 (1985).

- 18) D
- 19) B
- 20) D
- 21) A
- 22) A
- 23) A
- 24) C
- 25) B