1. Suppose the slope of a short-run production function is given by $\frac{2}{L^{0.5}}$. Which of the following statements are true?
   I. The marginal product of the 5th worker is 0.20.
   II. The production function exhibits increasing marginal returns.
   III. The marginal product of the 16th worker is 0.50.
   IV. The production function’s slope eventually changes from positive to negative as the firm produces more and more units of output.

   A. II. and III.
   B. I. and IV.
   C. III. only.
   D. I., II., and IV.

2. Brenda’s Pastry employs three workers who produce 6 dozen pastries per hour. After Brenda hires a fourth worker, the number of pastries produced increases to 7 dozen per hour. Which of the following statements are true?

   A. Because the marginal product of the fourth worker is greater than the average product of three workers, the average product must fall.
   B. Because the marginal product of the fourth worker is less than the average product of three workers, the average product must rise.
   C. Because the marginal product of the fourth worker is greater than the average product of three workers, the average product must rise.
   D. Because the marginal product of the fourth worker is less than the average product of three workers, the average product must fall.

3. If a firm is using a lot of capital and just a little labor, the marginal product of labor is:

   A. low relative to the marginal product of capital, making it more difficult to substitute labor for capital.
   B. high relative to the marginal product of capital, making it easier to substitute labor for capital.
   C. high relative to the marginal product of capital, making it more difficult to substitute labor for capital.
   D. low relative to the marginal product of capital, making it easier to substitute labor for capital.

4. Suppose a firm is producing 2,475 units of output by hiring 50 workers ($W = $20 per hour) and 25 units of capital ($R = $10 per hour). The marginal product of labor and marginal product of capital are 40 and 25, respectively. Is the firm minimizing the cost of producing 2,475 units of output?

   A. Yes, the ratio of the number of workers to the wage equals the ratio of the number of units of capital to the rental rate.
   B. No, the firm should use more labor and less capital.
   C. No, the firm should use more capital and less labor.
   D. No, the firm should use both more labor and capital.
5. Suppose a firm with a production function given by $Q = 30K^{0.5}L^{0.5}$ produces 1,500 units of output. The firm pays a wage of $40 per unit and pays a rental rate of capital of $640 per unit. How many units of labor and capital should the firm employ to minimize the cost of producing 1,500 units of output?
(Note: $MPL = 15K^{0.5}/L^{0.5}$; $MPK = 15L^{0.5}/K^{0.5}$)

A. $L = 200; K = 12.5$.
B. $L = 625; K = 4$.
C. $L = 275; K = 8.75$.
D. $L = 150; K = 10$.

6. Which of the following statements are true?
I. If marginal cost is rising, the average total cost must be rising.
II. The marginal costs curve intersects both the average total and average variable cost curves at their minimum points.
III. If marginal cost is less than average variable cost, the average variable costs curve is negatively sloped.

A. I., II., and III.
B. I. and III.
C. II. only.
D. II. and III.

7. Charlie's Umbrellas has a production function given by $Q = 10K^{0.5}L^{0.5}$, where $MPL = 5K^{0.5}/L^{0.5}$ and $MPK = 5L^{0.5}/K^{0.5}$. Charlie is using 9 units of capital (K) in the short run. The wage (W) is $80 per day and the rental rate per unit of capital (R) is $5 per day. What is Charlie's total cost of producing 60 umbrellas?

A. $445$.
B. $365$.
C. $108$.
D. $276$.

8. Which of the following statements are true?
I. If a firm experiences economies of scale, long-run average total cost rises with increases in output.
II. Diseconomies of scale are associated with the portion of the long-run average total cost curve that slopes upward.
III. For the long-run average total cost curve to slope downwards, the total cost of production must increase less than proportionately with output.
IV. A firm may experience economies of scale despite a production function with constant returns to scale.

A. I. II., and III.
B. II., III., and IV.
C. II. and III.
D. I. only.
9. In the market for lock washers, a perfectly competitive market, the current equilibrium price is $5.00 per box. Washer King, one of the many producers of washers, has a daily short-run total cost given by TC = 190 + 0.20Q + 0.0025Q^2, where Q measures boxes of washers. Washer King's corresponding marginal cost is MC = 0.20 + 0.005Q. How many boxes of washers should Washer King produce per day to maximize profit?

A. 280.
B. 960.
C. 1,450
D. 2,125.

10. A firm's short-run total cost is TC = 10,100 + 7,700Q − 100Q^2 + \frac{Q^3}{3} and its marginal cost is MC = 7,700 − 200Q + Q^2. What is the firm's shutdown price?

A. $45.
B. $200.
C. $1,100.
D. $18
E1. A perfectly competitive industry consists of many identical firms, each with a long-run average total cost of \( \text{LATC} = 800 - 10Q + 0.1Q^2 \) and long-run marginal cost of \( \text{LMC} = 800 - 20Q + 0.3Q^2 \).

a. In long-run equilibrium, how much will each firm produce?

b. What is the long-run equilibrium price?

c. The industry's demand curve is \( Q^D = 40,000 - 70P \). How many units do consumers buy in long-run equilibrium? How many firms are in the industry?

d. Suppose the industry's demand curve rises to \( Q^D = 40,600 - 70P \). How many new firms will enter this constant-cost industry in the long-run?