

True/False/Uncertain and *Explain*

Indicate whether the following statements are **True**, **False**, or **Uncertain**, and give a short (2-3 sentences) **explanation**.

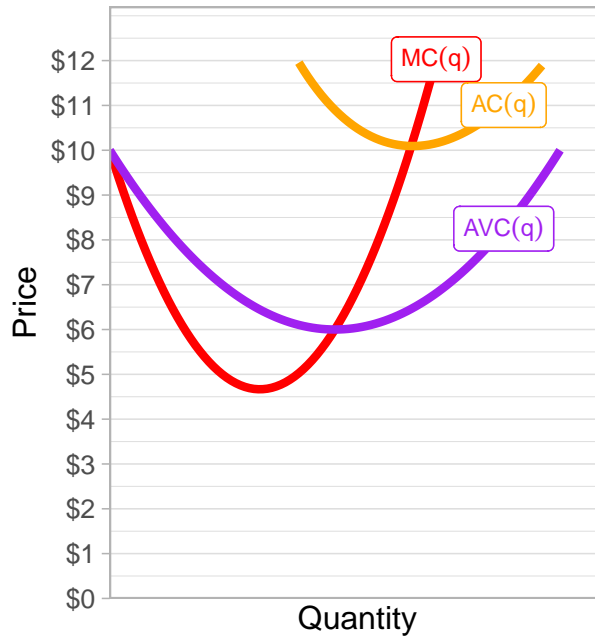
1. In the long run for a competitive industry with constant costs, an increase in demand will have no effect on market price.

2. A firm with the following production function

$$q = 4l + 2k$$

has technology that exhibits *decreasing returns to scale*.

3. The graph below depicts the cost structure for a representative firm in a competitive industry:



According to the graph, the firm will break even at a market price of \$10, and shut down in the short run below a market price of \$6.

4. It is possible for a firm to be earning an economic profit, but not an accounting profit.

5. A firm should shut down production in the short run when its variable costs exceed its total revenues at its profit-maximizing quantity.

6. Suppose the price of copper, a mineral that requires significant mining equipment to acquire, suddenly rises. In the *short run*, Copper suppliers are likely to *supply a lot more copper* because their supply is *elastic*.

Short Answer (10 points each)

If applicable, show all work and clearly label all graphs.

7. Briefly explain how we derive the long run average cost curve for a firm. Draw an example graph to demonstrate your explanation.

8. Explain the difference between *economies of scale* and *returns to scale*.

9. Explain why fixed costs only exist in the short run.

10. Explain the difference between a fixed cost and a sunk cost.

11. Write a production function and draw two example isoquants that describes the following technology:
an automotive assembly plant can assemble 1 car for every combination of 4 wheels and 1 engine.

Problems

Show all work. You may *not* earn full credit if you only write the answer, even if correct.

12. You have a firm with the following production function:

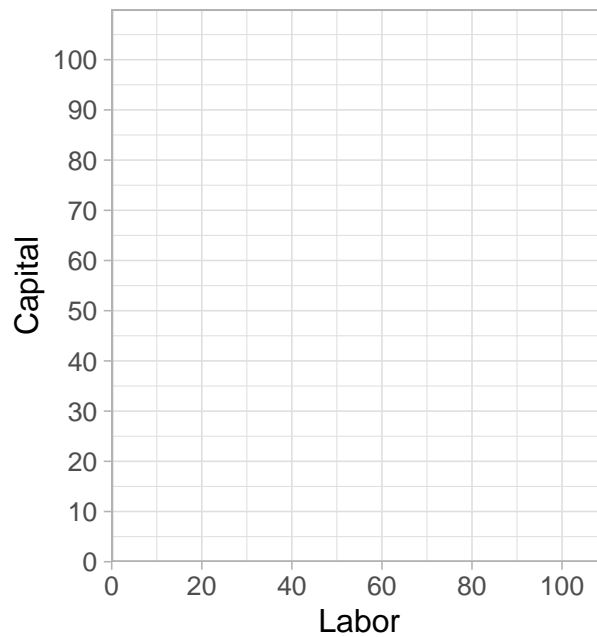
$$y = kl$$

- In the short run, the firm has 5 units of capital. Write out the short-run production function.
- Write down the total product, marginal product, and average product of labor for 0, 1, 2, 3, 4, and 5 workers.
- In the long run, the marginal products of labor and capital, respectively, are:

$$MP_l = k$$

$$MP_k = l$$

Suppose your firm needs to produce 1,000 units of output, the price of labor is \$20, and the price of capital is \$50. Find the optimal (i.e. cost-minimizing) combination of labor and capital that produces 1,000 units.



- What is the total cost of producing with the optimal combination?
- Graph the isoquant, isocost line, and optimum on the graph above.
- In the long run, does this production function exhibit constant, increasing, or decreasing returns to scale?

13. Suppose you are a restaurant operating in the very competitive D.C. brunch market. You have a cost structure as follows, where q is hundreds of meals served per day.

$$C(q) = 2q^2 + 4q + 18$$

$$MC(q) = 4q + 4$$

- a. Write the equations for (i) fixed costs, (ii) variable costs, (iii) average fixed costs, (iv), average variable costs, and (v) average (total) costs.
- b. The market price is currently \$12. Calculate the profit-maximizing quantity of output.
- c. At the profit-maximizing quantity, calculate the average cost.
- d. At the profit-maximizing price and quantity, calculate the total profit. Should this firm stay or exit the market in the long run?
- e. Should this firm produce or shut down in the short run?
- f. What price would the firm need to charge in order to break even?
- g. In the long run, what must the equilibrium market price be for this industry, and why?

Long Answer (10 points each)

Please answer clearly and concisely (2-5 sentences is sufficient). If applicable, show all work and clearly label all graphs.

14. Explain why in a market economy, a firm's profits go to entrepreneurs and shareholders (e.g. and not to workers, etc).
15. Describe, as completely as you can, what the firm's short-run supply curve looks like and what the firm's long-run supply curve looks like. Draw a graph. What are the main differences?
16. Give an example of an economic rent, and how in a competitive industry, economic profits will still fall to zero in the long run.

Formulas

$$wl + rk = C$$

$$\epsilon_{q,p} = \frac{1}{\text{slope}} \times \frac{p}{q}$$

- Two curves are *tangent* at a point \iff two curves have the same slope *at that point*