

Problem Set #5

Cost Functions, Cost Curves

For each of the following production functions, derive the firm's conditional factor demands and long run cost function. Then, derive the firm's short run cost function.

1. $Q = k^{1/4}l^{1/4}$

2. $Q = k^{1/2}l^{1/2}$

3. $Q = k^{3/4}l^{3/4}$

4. $Q = \text{Min}\{k, l\}$

5. $Q = 4k + 2l$

6. – 10. Now, assume that the firm faces input prices of \$1 for labor and capital. Graph the firm's long run and short run cost functions. (For the short run cost functions, assume that the firm has 16 units of capital.)

11. – 15. Now, using the short run cost functions that you derived in problems 1 through 5, graph the firm's marginal cost, average total cost, and average variable cost curves. (Once again, assume that the firm has 16 units of capital and assume that the input prices are each \$1.)

16. – 20. Finally, provide an intuitive explanation for i) The shape of the long run total cost curve
ii) The shape of the short run average total cost curve

21. Suppose that a firm has the following short run total cost function:

$$C(Q) = 8Q^3 + 24Q + 48$$

- Find the expressions for the firm's total variable cost and total fixed cost.
- Find the expressions for the firm's ATC, AVC, and MC.
- Graph the firm's ATC, AVC, and MC curves.