

EconS 301

Written Assignment #7

Due date: November 8th 2016.

Exercise #1. Consider a firm with the following Cobb-Douglas product function for labor and capital

$$q = 8L^{1/3}K^{1/2}$$

As we showed in Homework #6, if input prices are $w = \$3$ and $r = \$2$, the total cost function of this firm is

$$TC = 0.3801q^{6/5},$$

which leaves the total cost as a function of output q alone. (Please see part g of Exercise #1 in the answer key to Homework #6 for more details.) Assume that the firm operates in a perfectly competitive market, meaning that the firm faces a price p for each unit of output, which is unaffected by its output decision.

- a) Set up the firm's profit-maximization problem.
- b) Differentiate with respect to q , set your result equal to zero, and solve for q .
- c) *Long-run supply curve.* Use the above total cost function $TC(q)$ to find the average cost function, $AC(q) = \frac{TC(q)}{q}$. Find the minimum of the $AC(q)$ curve, which constitutes the "shut-down price" in a long-run setting.
 - *Hint:* Recall that you can find the minimum of the $AC(q)$ curve using two approaches: (1) obtaining the derivative of $AC(q)$ with respect to q , set it equal to zero, solve for q , and then evaluate $AC(q)$ at the output q you just found; or (2) set $AC(q) = MC(q)$, solve for q , and then evaluate $AC(q)$ at the output q you just found.
- d) Use the above "shut-down price" in a long-run setting to describe the firm's long-run supply curve.

Exercise #2. Repeat your analysis of Exercise #1 for the following linear production function

$$q = 7L + 4K$$

As we showed in Homework #6, if input prices are $w = \$3$ and $r = \$2$, the total cost function of this firm is

$$TC = \frac{3}{7}q = 0.42857q$$

Leaving the total cost as a function of output q alone. (Please see part g of Exercise #2 in the answer key to Homework #6 for more details.) Assume that the firm operates in a perfectly competitive market, meaning that the firm faces a price p for each unit of output, which is unaffected by its output decision.

Exercise #3. Repeat your analysis of Exercise #1 for the following fixed-proportion production function

$$q = \min\{2L, 3K\}$$

As we showed in Homework #6, if input prices are $w = \$3$ and $r = \$2$, the total cost function of this firm is

$$TC = \frac{13}{6}q = 2.167q$$

which leaves the total cost as a function of output q alone. (Please see part g of Exercise #3 in the answer key to Homework #6 for more details.) Assume that the firm operates in a perfectly competitive market, meaning that the firm faces a price p for each unit of output, which is unaffected by its output decision.

Exercise #4. Consider a firm with total costs

$$TC = a + bq + cq^2$$

- a) Identify the fixed cost FC , and the variable cost of this firm, $VC(q)$. (Each of them is just a part of the total cost.)
- b) Find the average cost $AC(q)$, and the marginal cost $MC(q)$.
- c) *Long-run supply curve.* Find the minimum of the $AC(q)$ curve, which constitutes the “shut-down price” in a long-run setting. Use this “shut-down price” to describe the firm’s long-run supply curve.
- d) Evaluate the long-run supply curve at $a = 10$, $b = 4$, and $c = 2$.
- e) *Short-run supply curve.* Use your results from part (a) to find the average variable cost function, $AVC(q) = \frac{VC(q)}{q}$. Find the minimum of the $AVC(q)$ curve, which constitutes the “shut-down price” in a short-run setting. Use this “shut-down price” to describe the firm’s short-run supply curve.
- f) Evaluate the short-run supply curve at $a = 10$, $b = 4$, and $c = 2$.