EC 201, Fanis Homework #7: 5, 7, 9

At all prices above the shut-down point, the *MC* curve shows the profit-maximizing level of output. At all prices below it, optimal short-run output is zero.

6. The *short-run supply curve* of a firm in a perfectly competitive industry is the portion of its marginal cost curve that lies above its average variable cost curve.
7. Two things can cause the industry supply curve to shift: (1) in the short run, anything that causes marginal costs to change across the industry, such as an increase in the price of a particular input, and (2) in the long run, entry or exit of firms.

LONG-RUN COSTS: ECONOMIES AND DISECONOMIES OF SCALE

8. When an increase in a firm's scale of production leads to lower average costs, the firm exhibits *increasing returns to scale,* or *economies of scale.* When average costs do not change with the scale of production, the firm exhibits *constant returns to scale.* When an increase in a firm's scale of production leads to higher average costs, the firm exhibits *diseconomies of scale.*
9. A firm's *long-run average cost curve (LRAC)* shows the costs associated with different scales on which it can choose to operate in the long run.

LONG-RUN ADJUSTMENTS TO SHORT-RUN CONDITIONS

10. When short-run profits exist in an industry, firms will enter and existing firms will expand. These events shift the industry supply curve to the right. When this happens, price falls and ultimately profits are eliminated.
11. When short-run losses are suffered in an industry, some firms exit and some firms reduce scale. These events shift the industry supply curve to the left, raising price and eliminating losses.
12. *Long-run competitive equilibrium* is reached when $P = SRMC = SRAC = LRAC$ and profits are zero.
13. In efficient markets investment capital flows toward profit opportunities.

REVIEW TERMS AND CONCEPTS

breaking even, 178
constant returns to scale, 185
decreasing returns to scale, or diseconomies of scale, 185
increasing returns to scale, or economies of scale, 185
long-run average cost curve (*LRAC*), 187
long-run competitive equilibrium, 194
operating profit (or loss) or net operating revenue, 180
optimal scale of plant, 190
short-run industry supply curve, 183
shut-down point, 182
long-run competitive equilibrium: $P = SRMC = SRAC = LRAC$

PROBLEM SET

1. For each of the following say whether you agree or disagree and explain your answer:
   a. Firms that exhibit constant returns to scale have U-shaped long-run average cost curves.
   b. A firm suffering losses in the short run will continue to operate as long as total revenue will at least cover fixed cost.
2. Ajax is a competitive firm operating under the following conditions: Price of output is $5, the profit-maximizing level of output is 20,000 units of output, and the total cost (full economic cost) of producing 20,000 units is $120,000. The firm's *only* fixed factor of production is a $300,000 stock of capital (a building). If the interest rate available on comparable risks is 10 percent, this firm should shut down immediately in the short run.
3. Explain why it is possible that a firm with a production function that exhibits increasing returns to scale can run into diminishing returns at the same time.
4. Which of the following industries do you think are likely to exhibit large economies of scale? Explain why in each case.
   a. Home building
   b. Electric power generation
   c. Vegetable farming
   d. Software development
   e. Aircraft manufacturing
5. For cases A through F below, would you (1) operate or shut down in the short run, and (2) expand your plant or exit the industry in the long run?

	A	*B*	*C*	*D*	*E*	*F*
Total revenue	1,500	2,000	2,000	5,000	5,000	5,000
Total cost	1,500	1,500	2,500	6,000	7,000	4,000
Total fixed cost	500	500	200	1,500	1,500	1,500

6. Do you agree or disagree with the following statements? Explain why in a sentence or two.
   a. A firm will never sell its product for less than it costs to produce it.
   b. If the short-run marginal cost curve is U-shaped, the long-run average cost curve is likely to be U-shaped as well.
7. The Smythe chicken farm outside of Little Rock, Arkansas, produces 25,000 chickens per month. Total cost of production at the Smythe farm is $28,000. Down the road are two other farms. The Faubus Farm produces 55,000 chickens a month and total cost is $50,050. Mega Farm produces 100,000 chickens

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per month at a total cost of $91,000. These data suggest that there are significant economies of scale in chicken production. Do you agree or disagree with this statement? Explain your answer.

8. Indicate whether you agree or disagree with each of the following statements. Briefly explain your answers.
   a. Firms that exhibit constant returns to scale have U-shaped long-run average cost curves.
   b. Firms minimize costs. Thus, a firm earning short-run profits will choose to produce at the minimum point on its average total cost function.
   c. The supply curve of a competitive firm in the short run is its marginal cost curve above average total cost.
   d. A firm suffering losses in the short run will continue to operate as long as total revenue will at least cover fixed cost.

9. You are given the following cost data:

Q	*TFC*	*TVC*
0	12	0
1	12	5
2	12	9
3	12	14
4	12	20
5	12	28
6	12	38

If the price of output is $7, how many units of output will this firm produce? What is the total revenue? What is the total cost? Will the firm operate or shut down in the short run, and in the long run? Briefly explain your answers.

10. The following cost data are given for a small pushcart business. The business was started by partners Ann and Sue, who purchased a new pushcart with $20,000 of their own money. The pushcart is located at the Denver airport and is used to sell leather belts. Each year Ann and Sue sell 3,000 belts for $10 each. The belts cost them $5 each from their supplier. Staffing the cart 12 hours a day costs them $14,000 in wages per year. If the normal rate of return is 10 percent, how much profit are Ann and Sue making?

11. The following problem traces the relationship between firm decisions, market supply, and market equilibrium in a perfectly competitive market.
   a. Complete the following table for a single firm in the short run:

Output	*TFC*	*TVC*	*TC*	*AVC*	*ATC*	*MC*
0	$300	$ 0	____	____	____	____
1	____	100	____	____	____	____
2	____	150	____	____	____	____
3	____	210	____	____	____	____
4	____	290	____	____	____	____
5	____	400	____	____	____	____
6	____	540	____	____	____	____
7	____	720	____	____	____	____
8	____	950	____	____	____	____
9	____	1,240	____	____	____	____
10	____	1,600	____	____	____	____

   b. Using the information in the table, fill in the following supply schedule for this individual firm under perfect competition, and indicate profit (positive or negative) at each output level. (*Hint:* At each hypothetical price, what is the *MR* of producing one more unit of output? Combine this with the *MC* of another unit to figure out the quantity supplied.)

Price	Quantity Supplied	Profit
$ 50	____	____
70	____	____
100	____	____
130	____	____
170	____	____
220	____	____
280	____	____
350	____	____

   c. Now suppose there are 100 firms in this industry, all with identical cost schedules. Fill in the market quantity supplied at each price in this market:

Price	Market Quantity Supplied	Market Quantity Demanded
$ 50	____	1,000
70	____	900
100	____	800
130	____	700
170	____	600
220	____	500
280	____	400
350	____	300

   d. Fill in the blanks: From the market supply and demand schedules in c., the equilibrium market price for this good is _____ and the equilibrium market quantity is _____. Each firm will produce a quantity of _____ and earn a _____ (profit/loss) equal to _____.
   e. In d., your answers characterize the short-run equilibrium in this market. Do they characterize the long-run equilibrium as well? If yes, explain why. If no, explain why not (i.e., what would happen in the long run to change the equilibrium, and why?).

*12. Assume that you are hired as an analyst at a major New York consulting firm. Your first assignment is to do an industry analysis of the tribble industry. After extensive research and two all-nighters, you have obtained the following information.
   - *Long-run costs:*
     Capital costs: $5 per unit of output
     Labor costs: $2 per unit of output
   - No economies or diseconomies of scale
   - Industry currently earning a normal return to capital (profit of zero)
   - Industry perfectly competitive, with each of 100 firms producing the same amount of output
   - *Total industry output:* 1.2 million tribbles

   Demand for tribbles is expected to grow rapidly over the next few years to a level twice as high as it is now, but (due to short-run diminishing returns) each of the 100 existing firms is likely to be producing only 50 percent more.
   a. Sketch the long-run cost curve of a representative firm.
   b. Show the current conditions by drawing two diagrams, one

*Note: Problems marked with an asterisk are more challenging.

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