

Boston College  
Problem Set 5, Fall 2012  
EC 131 - Principles of Microeconomics  
Instructor: Inacio G L Bo

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page. Be succinct. Longer answers don't increase your chance of being right, but increase your chance of saying something wrong. **Show how you got your answers in mathematical questions**

Name: \_\_\_\_\_

1. Say whether the propositions are True or False. If they are False, justify.
- (a) If the marginal cost of producing the tenth unit of output is \$3, and if the average total cost of producing the tenth unit of output is \$2, then at ten units of output, average total cost is rising.

**Solution:** True.

- (b) In competitive markets, firms that raise their prices are typically rewarded with larger profits.

**Solution:** False. If a firm raises price above equilibrium price, the demand for that firm's production will be zero, and thus revenue will also drop to zero.

- (c) A firm operating in a perfectly competitive market may earn positive, negative, or zero economic profit in the long run.

**Solution:** False. Economic profits for firms in a competitive market are always zero in the long run.

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2. Consider that the short run (that is, not allowing for change in the amount of capital) production function for burritos at El Pelon is the following:

Hours of Work	Burritos
0	0
1	30
2	55
3	75
4	90
5	100
6	105
7	107

- (a) Does this production function satisfy the diminishing marginal product condition? **Justify.**

**Solution:** Yes, since the addition of one more hour adds respectively 30, 25, 20, 15, 10, 5 and 2, which are decreasing values.

- (b) Consider for the following items that the hourly wage at El Pelon is \$10/h, and that the rent is \$50. Fill the table below with the values being asked. For the MPL items, write them in the line before the change in production (that is, the first value is at the first line, and the last line is left empty):

Hours of Work	Burritos	MPL	FC	VC	TC	AFC	AVC	ATC
0	0					–	–	–
1	30							
2	55							
3	75							
4	90							
5	100							
6	105							
7	107	–						

**Solution:**

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Hours of Work	Burritos	MPL	FC	VC	TC	AFC	AVC	ATC
0	0	\$ 30	\$ 50	\$ 0	\$ 50	—	—	—
1	30	\$ 25	\$ 50	\$ 10	\$ 60	\$ 1.67	\$ 0.33	\$ 2
2	55	\$ 20	\$ 50	\$ 20	\$ 70	\$ 0.91	\$ 0.36	\$ 1.27
3	75	\$ 15	\$ 50	\$ 30	\$ 80	\$ 0.67	\$ 0.40	\$ 1.07
4	90	\$ 10	\$ 50	\$ 40	\$ 90	\$ 0.55	\$ 0.44	\$ 1
5	100	\$ 5	\$ 50	\$ 50	\$ 100	\$ 0.50	\$ 0.50	\$ 1
6	105	\$ 2	\$ 50	\$ 60	\$ 110	\$ 0.48	\$ 0.57	\$ 1.05
7	107	—	\$ 50	\$ 70	\$ 120	\$ 0.47	\$ 0.65	\$ 1.12

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3. (a) Suppose that the market for energy drink is competitive with price \$5.00 and fill in the table below (for the MR and MC columns, shift the numbers to the row above to fill in here, as you did for the MPL in question 2) :

Quantity	TR	FC	VC	TC	ATC	AVC	Profit	MR	MC
1		\$30	\$2						
2		\$30	\$5						
3		\$30	\$9						
4		\$30	\$14						
5		\$30	\$20						
6		\$30	\$27						
7		\$30	\$35					–	–

**Solution:**

Quantity	TR	FC	VC	TC	ATC	AVC	Profit	MR	MC
1	\$ 5	\$30	\$2	\$ 32	\$ 32	\$ 2	-\$ 27	\$ 5	\$ 3
2	\$ 10	\$30	\$5	\$ 35	\$ 17.50	\$ 2.50	-\$ 25	\$ 5	\$ 4
3	\$ 15	\$30	\$9	\$ 39	\$ 13	\$ 3.00	-\$ 24	\$ 5	\$ 5
4	\$ 20	\$30	\$14	\$ 44	\$ 11	\$ 3.50	-\$ 24	\$ 5	\$ 6
5	\$ 25	\$30	\$20	\$ 50	\$ 10	\$ 4.00	-\$ 25	\$ 5	\$ 7
6	\$ 30	\$30	\$27	\$ 57	\$ 9.50	\$ 4.50	-\$ 27	\$ 5	\$ 8
7	\$ 35	\$30	\$35	\$ 65	\$ 9.28	\$ 5.00	-\$ 30	–	–

- (b) How many units of energy drink will a firm produce in this market? **Justify**

**Solution:** Either 3 or 4 units, since these are the production levels that maximize profits.

- (c) How much profit will a firm have in this market?? Will they shut down in the short run? Will they exit in the long run? **Justify**

**Solution:** The firm will have a loss of \$24. The firm will not shut down in the short run, since AVC is lower than the price when  $Q = 3$  (or  $Q = 4$ ). Since  $P < ATC$ , at those production levels, however, the firm will exit in the long run.

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4. Suppose that the cost for the production for Domino's Pizzas (where pizza is a competitive market) is given by the following function:

$$C(Q) = 40 + 3Q + 0.5Q^2$$

- (a) What is the fixed cost for the production of pizzas?

**Solution:** The fixed cost is the part of the total cost that doesn't depend on the quantity produced: \$40.

- (b) Provide the expressions for the marginal cost (MC), average total cost (ATC), the average fixed cost (AFC) and for the average variable cost (AVC)

**Solution:**

$$ATC = \frac{TC}{Q} = \frac{40 + 3Q + 0.5Q^2}{Q} = \frac{40}{Q} + 3 + 0.5Q$$

$$AFC = \frac{FC}{Q} = \frac{40}{Q}$$

$$AVC = \frac{VC}{Q} = \frac{3Q + 0.5Q^2}{Q} = 3 + 0.5Q$$

$$MC = \frac{dC(Q)}{dq} = 3 + Q$$

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- (c) Suppose that the market price for pizza is \$13. How many pizzas will Domino's produce?

**Solution:** Profit maximization implies  $MR = MC$ . Competitive market implies  $MR = P$ . Thus, firm will set  $MC = P$ :

$$3 + Q = 13 \implies Q = 10$$

Domino's will thus produce 10 pizzas.

- (d) What will be Domino's profit? Will they shut down in the short run? Will they exit in the long run? **Justify**

**Solution:**

Profit is total revenue (TR) minus total cost:

$$Profit = P \times Q - C(Q)$$

$$Profit = 13 \times Q - (40 + 3Q + 0.5Q^2)$$

Since  $Q = 10$ :

$$\begin{aligned} Profit &= 13 \times 10 - (40 + 3 \times 10 + 0.5 \times 10^2) = \\ &= 130 - 40 - 30 - 50 = 10 \end{aligned}$$

Thus Domino's will have a profit of \$10. Given that profit is positive, clearly  $P > ATC$  and since  $ATC > AVC$ , it's also the case that  $P > AVC$ . The firm will not shut down in the short run or exit in the long run.

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- (e) Given the profit maximizing choice and its relation with the average total cost (ATC) and marginal cost (MC), is Domino's producing more or less than the efficient scale?

**Solution:**

When  $Q = 10$ , the values of MC and ATC are:

$$MC = 3 + Q = 13$$

$$ATC = \frac{40}{Q} + 3 + 0.5Q = 4 + 3 + 5 = 12$$

Thus,  $MC > ATC$ . Remembering that the  $MC$  curve crosses the  $ATC$  curve once at the efficient scale point, this implies that production is to the right of the efficient scale (that is, production is higher than the efficient scale).