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Department of Economics
Economics 201
Spring 2023

Homework #3 (due by 9:00pm on Friday, March 3)

*Please submit your answers to this homework through the Assignment link at Blackboard. **No credit will be given for answers submitted in class or emailed to the professor, regardless of the excuse.** This includes unique excuses like the police confiscated my computer right before I was going to submit it, excuses like “I lost my Internet”, etc. Please note that all submissions are final, again – regardless of the excuse (which includes “I accidentally hit the submit button”). Note that Blackboard allows you to save your answers, but you must hit the “Save and Submit” button to submit your answers. If you are unfamiliar with Blackboard, then it would be a good idea to visit the class page at Blackboard and check out the homework assignments as they are posted.*

Please note that when Blackboard grades homework answers, more specifically – answers to the fill-in-the-blank questions – your answer must match exactly with the answer that Blackboard is looking for. Below, you’ll find some instructions on how to properly format these answers. Reading this section is strongly recommended.

Homework Questions 1-3, and 7-9

Formatting matters with the answers in these questions. For this reason, **understand that your answer can be technically correct but graded as wrong because you didn't follow the directions provided below.** Given that formatting is considered part of your answer, a wrongly formatted answer is still a wrong answer.

Please note the following comments below.

*(a) **On questions #1, #2, #7, #8 and #9** please express your answer in terms of dollars, not dollars and cents. I.e., please round your answer to the nearest whole dollar. E.g., if you calculate AC as \$152.10, then express your answer as \$152 and not \$152.10, 152.10 or 152.*

*(b) **On question #3a**, please round your answer to the nearest whole number. E.g., if you calculate APL as 20, then write your answer as 20, and not 20.0 or 20.00.*

*(c) **On question #3b**, please express your answer as a decimal rounded to the nearest tenth and not as a fraction. E.g., if you calculate MPL as 10/20, then write your answer as 0.5, and not 0.50, 1/2 or 10/20.*

*(d) **On questions #7-9**, if you get a loss for your answer, then include the negative sign and leave no space between the negative and dollar signs (in addition to expressing your answer in just dollars, not dollars and cents. E.g., write a \$55 loss as -\$55 and not as -\$55.00, - \$55.00 or - \$55.*

If you have any questions about the comments above, then please ask them before submitting your homework for grading. Once homework is submitted, it's too late to make any changes.

Homework #3 Questions

1. A firm has the following costs (q = output, TC = total costs, MC = marginal costs):

$$\begin{array}{ll} TC = \$120 & \text{if } q = 0 \\ TC = 0.1q^3 - 2q^2 + 60q + 200 & \text{if } q > 0 \\ MC = 0.3q^2 - 4q + 60 & \text{if } q > 0 \end{array}$$

Based on the equations above, please calculate the various types of cost below and remember to express your answer in terms of dollars, not dollars and cents.

- If this firm produces 20 units of output, then the firm's average cost is _____
- If this firm produces 20 units of output, then the firm's average variable cost is _____
- If this firm produces 20 units of output, then the firm's average fixed cost is _____
- If this firm produces 20 units of output, then the firm's sunk cost is _____
- If this firm produces 20 units of output, then the firm's recoverable fixed cost is _____

2. Assume that a firm has the following costs (q = output, TC = total costs, MC = marginal costs):

$$\begin{array}{ll} TC = \$40 & \text{if } q = 0 \\ TC = q^2 + 10q + 200 & \text{if } q > 0 \\ MC = 2q + 10 & \text{if } q > 0 \end{array}$$

Based on the equations above, please calculate the various types of cost below. Remember to express your answer in terms of dollars, not dollars and cents.

- If we assume this firm operates under profit maximizing principles and that the market price is \$90, then the firm's average cost (AC) is equal to _____
- If we assume this firm operates under profit maximizing principles and that the market price is \$90, then the firm's average variable cost (AVC) is equal to _____
- If we assume this firm operates under profit maximizing principles and that the firm is producing 50 units of output, then the profit for this firm is equal to _____

3. Firm A is a relatively small distribution firm that transports the goods produced by different manufacturers to various retail locations in the Greater Louisville area. The firm has its own capital, secretarial staff and managers, but hires all other laborers (dock workers and drivers) on a daily basis from a temporary services company.

Given the above, we can state the following about firm A:

- *Labor is variable.* I.e., the output of firm A depends entirely on how many dock workers and drivers are hired on any given day.
- *Capital is fixed.* I.e., no matter how much output may change from day to day, firm A uses the same fixed quantity of capital (e.g. warehouse, office space, forklifts and trucks).
- Assume that firm A's output is characterized by this production function: $Q = 20\sqrt{4L}$

a. If this firm hires 4 units of labor, then the average product of labor for this firm would be equal to _____

(round your answer to the nearest whole number – e.g. 31.421 would be 31, not 31.4).

b. If this firm increases the quantity of labor hired from 4 units to 5 units, then the marginal product of labor for this firm would be equal to _____

(round your answer to the nearest tenth – e.g. 31.421 would be 31.4, not 31 or 31.42).

To answer Questions #4-5, you must access the *DMR.pdf* article posted within the Homework #3 material folder in Course Documents at Blackboard. This article discusses the relevance of the Law of Diminishing Returns in the average, everyday life of individuals.

4. According to the article, the law of diminishing marginal returns is a principle that states which of the following:

- a. after a certain point, each additional unit of input results in less output
- b. after a certain point, each additional unit of input results in lower costs
- c. after a certain point, each additional unit of input results in greater profit
- d. after a certain point, each additional unit of input results in a smaller increase in output
- e. answers a and d are correct

5. If you consider the examples presented in the article and relate them to a graph of one's production function, how might someone avoid the inevitable effects of diminishing returns:

- a. by focusing on the quality of your effort, rather than the quantity of effort
- b. by engaging in other activities which effectively shift your production function upward
- c. by attempting to increase your productivity of input by taking more breaks
- d. (only) answers a and c are correct
- e. answers a, b and c are correct

6. Let's assume that you run a company where labor is the only variable factor (both capital and land are fixed factors). You sell widgets that are very inexpensive and you hire low skilled labor (because making cheap widgets doesn't require much skill), so the wage is fairly low (assume no minimum wage). Assume further that you have a production function equation which tells you how much output you get for different amounts of labor.

The information described above is given below. Use this information to answer the question.

- Price of widgets: $P = \$8$
- Wage (of each unit of labor that produces widgets): $w = \$35$
- The production function equation: $Q = 10\sqrt{5L}$

At this point, you must decide upon how many units of labor to hire. Making your decision should involve the use of marginal analysis, where you consider the marginal benefit and marginal cost of hiring specific amounts of labor. Based upon your analysis, choose the (overall) amount of labor from the list below that should be hired in this example.

- 1 unit of labor
- 2 units of labor
- 3 units of labor
- 4 units of labor
- 5 units of labor
- 6 units of labor
- 7 units of labor
- 8 units of labor
- 9 units of labor
- none of the above

Remember to express your answers to #7-8 in terms of dollars, not dollars and cents.

7. Assume that a profit-maximizing, perfectly competitive firm is currently producing 10 units of output at the shut down point. In addition, the firm has \$0 in recoverable fixed costs and total fixed cost of \$200.

Given this information, the firm's current profit is equal to _____

8. Assume that a profit-maximizing, perfectly competitive firm (not the firm in the previous question) is producing at the breakeven point. The firm's output is 10 units and the market price is \$100. The firm has \$400 in sunk cost and average variable cost of \$40.

Given this information, the total fixed cost of this firm is equal to _____

9. The questions in parts a-d below relate to Output-Cost table on the following page. Assume that the information in this table is taken from a single perfectly competitive firm that follows the basic profit maximizing principles discussed in class and the textbook.

Remember to express your answers in terms of dollars, and not dollars and cents.

Be sure to calculate profit using the profit equation from class: $\pi = (P \times q) - TC$

a. Assume that this perfectly competitive firm is operating as a profit maximizer when producing 20 units of output. If so, then this firm's current profits are equal to _____

Today, the market price is \$28.00 (i.e. $P = 28.00$)

b. The highest possible profits in this situation would be equal to _____

Suppose industry demand increases, causing the market price to become \$40.00 (i.e. $P = 40.00$)

c. The highest possible profits in this situation would be equal to _____

Industry demand increases again, causing the market price to become \$64.00 (i.e. $P = 64.00$)

d. The highest possible profits in this situation would be equal to _____

*In the Blackboard shell for this course, there's a folder entitled "**Homework #3 material**" that's located in the Course Documents section of Blackboard. Go to that folder, locate and read the article "Coffee Economics, a thought experiment" and use this article to answer question #10.*

10. Which of the following points **does this article state** when explaining why Starbucks (and maybe coffee shops in general) is not a good example of a firm that operates within a perfectly competitive market.

a. Starbucks sets price above average cost and earns positive economic profit in the short run.

b. Starbucks is a multiproduct firm which sells more than just coffee.

c. Starbucks implements branding in order to sell a product that is not identical to what other coffee shops necessarily sell.

d. Limited real estate makes makes entry into the coffee shop market more difficult for any potential competitors of Starbucks.

e. answers a and b are correct

f. answers c and d are correct

g. answers a, c and d are correct

h. answers a, b, c and d are correct

Firm A's Output and Costs:

q	TC	MC	AVC	AFC
0	100.00	—	—	—
1	206.00	8.00	6.00	200.00
2	216.00	12.00	8.00	100.00
3	230.00	16.00	10.00	66.67
4	248.00	20.00	12.00	50.00
5	270.00	24.00	14.00	40.00
6	296.00	28.00	16.00	33.33
7	326.00	32.00	18.00	28.57
8	360.00	36.00	20.00	25.00
9	398.00	40.00	22.00	22.22
10	440.00	44.00	24.00	20.00
11	486.00	48.00	26.00	18.18
12	536.00	52.00	28.00	16.67
13	590.00	56.00	30.00	15.38
14	648.00	60.00	32.00	14.29
15	710.00	64.00	34.00	13.33
16	776.00	68.00	36.00	12.50
17	846.00	72.00	38.00	11.76
18	920.00	76.00	40.00	11.11
19	998.00	80.00	42.00	10.53
20	1080.00	84.00	44.00	10.00
21	1166.00	88.00	46.00	9.52
22	1256.00	92.00	48.00	9.09
23	1350.00	96.00	50.00	8.70
24	1448.00	100.00	52.00	8.33
25	1550.00	104.00	54.00	8.00

Note that q = output, TC = total cost, MC = marginal cost, AVC = average variable cost, AFC = average fixed cost