

HOMEWORK THREE – due Thursday October 9thName: ANSWERS

1. Complete the following table:

Qx	MC	TFC	TVC	TC	AFC	AVC	ATC
0	-	150	-	150	-	-	-
2	50	150	100	250	75	50	125
4	20	150	140	290	37.5	35	72.5
6	25	150	190	340	25	31.66	56.66
8	50	150	290	440	18.75	36.25	55
10	80	150	450	600	15	45	60

Plot a graph with MC, AFC, AVC, ATC.

2. Using your own words, explain why marginal costs initially decreases and then increases.

MC is inversely related to MP. MP increases then decreases because increasing returns to labor occur due to specialization while diminishing marginal returns will always set in.

3. Using your own words, explain why the minimum of the ATC and AVC are equal to MC.

Answers will vary – should focus on something similar to the “grade” example – if the addition unit is higher than the average it will bring the average up, if the additional unit is less than the average it will bring the average down.

4. From your text, page 169 #1

a.	Accountants	Marginal Product
	0	
		5
	1	
		7
	2	
		5
	3	
		3
	4	
		2
	5	

- b. **Increasing marginal returns to labor are evident for the range between 0 and 2 accountants. Diminishing marginal returns then set in for each remaining accountant.**
- c. **The crucial assumption here is that the quantity of other, nonlabor inputs (equipment) remain fixed. Hence, additional accountants might not have ready access to computer**

equipment, printers, even desk space. This would decrease the services that each additional accountant could produce.

5. From your text, page 169 #2

- a. TC_1 gives long-run total cost because it registers the cost of 0 units of output as 0. In the long run, all inputs can be varied, and the cheapest way to produce zero output is to use zero inputs.

Short-run total costs are detailed in column TC_2 . In the short run, not all inputs can be varied, and there will be some fixed costs incurred, even at 0 output.

b.

Q	TFC	TVC	AFC	AVC	MC
0	\$350	\$ 0	—	—	
					\$ 50
1	\$350	\$ 50	\$350	\$ 50	
					\$ 35
2	\$350	\$ 85	\$175	\$ 43	
					\$ 30
3	\$350	\$115	\$117	\$ 38	
					\$ 40
4	\$350	\$155	\$ 88	\$ 39	
					\$ 55
5	\$350	\$210	\$ 70	\$ 42	
					\$ 75
6	\$350	\$285	\$ 58	\$ 48	
					\$100
7	\$350	\$385	\$ 50	\$ 55	

- c. At 3 units and 5 units, long-run total cost = short-run total cost; hence, in the short run, the firm must be producing these output levels with the same input mix.
- d. *Their managerial skills are wanting.* They overlook the economies of scale evident from the fact that when output doubles from 2 units to 4 units, long-run total cost *less* than doubles, implying that it is *not* necessary to double all inputs. Another way of saying this is that the firm is on the declining portion of the $LRATC$ curve.
- e. The most straightforward way to answer this problem is to compute $LRATC$ at each output level using the total cost figures in the column labeled TC_1 :

Q	LRATC
0	—
1	\$300
2	\$200
3	\$155
4	\$124
5	\$112
6	\$100
7	\$100

There are economies of scale (declining LRATC) from 1 to 6 units of output, and constant returns to scale (constant LRATC) from 6 to 7 units.

6. From your text, page 169/170 #4
- Point C*. In the short run, Ludmilla cannot adjust all her inputs to achieve the lowest cost input mix. She will travel along her short-run ATC curve, marked ATC_1 in the diagram.
 - Eventually, she wants to be at *point B*. She can get there by adjusting all of her inputs over the long run, to produce 20 units at the lowest possible cost.
 - At 70 schnitzels per day, the firm is operating at *point H*. Cutting back production to 20 units the way Hans wants to do it (reducing variable inputs only) would move the firm leftward along ATC_3 , substantially raising average cost in the short run. This would *not* return the firm back to its initial higher-profit, lower-output situation at *point B*. Ludmilla's method of scaling back *all* inputs would move the firm along its LRATC curve, permitting a return to *point B*. If the goal is to return to 20 units, Ludmilla's way will result in more profit in the long run.
 - We *cannot* tell from this diagram what output Ludmilla should aim for. While *point E* is the lowest-cost output level in the long run, the firm's goal is to maximize profit, not minimize cost per unit. Until we know how much *revenue* the firm would earn at each output level, we cannot say which output level would generate the highest profit.

7. From your text, page 170 #5

Output	Capital	Labor	TFC	TVC	TC	MC	AFC	AVC	ATC
0	1	0	\$75	\$ 0	\$75		—	—	—
30	1	1	75	50	125	\$1.67	\$2.50	\$1.67	\$4.17
70	1	2	75	100	175	1.25	1.00	1.42	2.50
120	1	3	75	150	225	1.00	0.63	1.25	1.88
160	1	4	75	200	275	1.25	0.47	1.25	1.72
190	1	5	75	250	325	1.67	0.39	1.32	1.71
210	1	6	75	300	375	2.50	0.36	1.43	1.79

- Clean n' Shine experiences increasing marginal returns to labor over the range of 0-120 units of output. It experiences decreasing marginal returns to labor at all output levels beyond 120.
 - Yes. Average fixed costs fall as output rises.
 - Yes. First, they all fall as output rises, then begin to rise as output continues to rise.
 - Yes. AVC and ATC both fall until they intersect MC, and then the rising marginal costs pull them up.
8. From your text, page 193/194 #2

a. **Annual explicit costs:**

cost of office equipment:	\$ 3,600
programmer's salary:	25,000
heat and light: $\$50 \square 12 =$	<u>600</u>
total explicit costs:	\$ 29,200

b. **Annual implicit costs:**

salary foregone:	\$ 35,000
investment income foregone: $\$10,000 \square .05 =$	500
rent foregone: $\$250 \square 12 =$	<u>3,000</u>
total explicit costs:	\$ 38,500

c. **Congratulations are not in order since *economic* profit for the year is $\$55,000 - (\$29,200 + \$38,500) = -\$12,700$.**

9. From your text, page 194 #4

The profit-maximizing level of output is 14, since the marginal revenue associated with the 14th unit equals the marginal cost of that unit (\$25). When output rises from 14 to 15, the marginal revenue of the 15th unit (\$23) is less than MC of that unit (\$27).

10. From your text, page 194 #6

- a. If the firm's fixed costs are \$3,000 per day, then its variable costs are $\$7,000 - \$3,000 = \$4,000$ per day. Since its total revenue is less than this amount, this firm should shut down in the short run.
- b. Since the firm is earning enough total revenue to cover these variable costs, it should continue to operate in the short run.