Economics 10: Problem Set 3 (With Answers)

1. Assume you own a bookstore that has the following cost and revenue information for last year:

- gross revenue from sales	$100,000
- cost of inventory	40,000
- wages to clerk	12,000
- utilities and taxes	8,000
- $10,000 of your money is invested in the firm; it could earn 10% if invested elsewhere	1,000
- you own the building; could be rented to someone else for $1,000 per month	12,000
- you manage the store; could make $22,000 managing for someone else	22,000

Determine explicit costs, opportunity cost, accounting profit, and economic profit for this firm.

- cost of inventory	40,000
- wages to clerk	12,000
- utilities and taxes	8,000
Total explicit costs:	**60,000**
Accounting profit:	**40,000**

Opportunity cost is the value of benefits foregone given the next best alternative solution

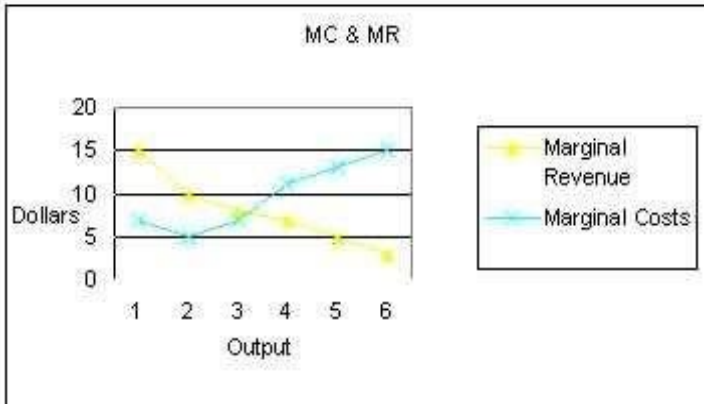
OC= explicit (direct) cost + implicit (imputed) cost

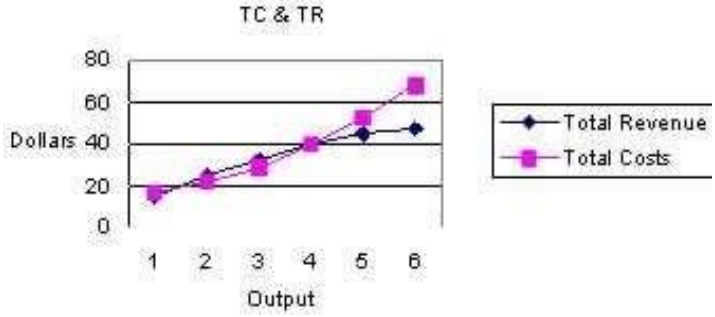
- cost of inventory	40,000
- wages to clerk	12,000
- utilities and taxes	8,000
- $10,000 of your money is invested in the firm; it could earn 10% if invested elsewhere	1,000
- you own the building; could be rented to someone else for $1,000 per month	12,000
- you manage the store; could make $22,000 managing for someone else	22,000
Total opportunity cost	**95,000**
Economic profit:	**5000**

2. Why is it necessary for a firm to equate marginal revenue and marginal cost in order to maximize its profits? What if the management of a firm discovers that marginal revenue is greater than marginal cost? What does this mean and what should the firm do?

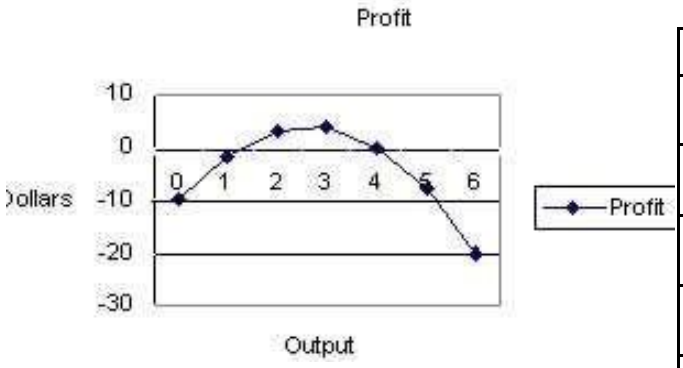
   MR is the extra revenue that the firm gets from producing an additional unit of output, and MC is the extra cost of this unit. The firm's operation earns the highest level of profits when MR=MC. To come to this conclusion, we use marginal analysis, which tells us that the marginal benefit and the marginal cost are always the relevant factors for optimal decisions. Any higher or lower level of production would lead to smaller profits.

   As long as MR>MC, you increase your profit by increasing output. The firm should increase production until MR=MC. The only exception is if a one-unit increase in output results in MR<MC. In such case it is acceptable to have a small discrepancy between MC and MR with MR being slightly higher than MC.



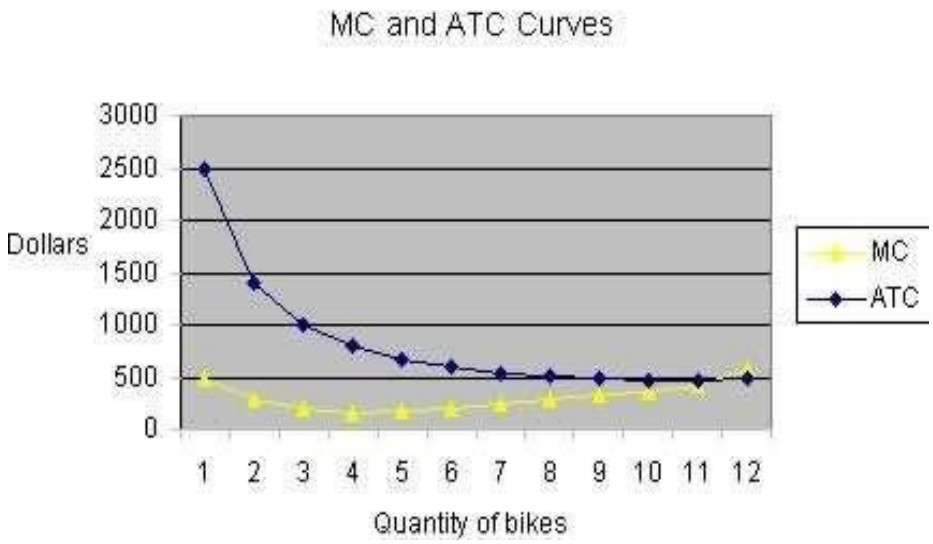


   Note: At the optimal decision profit is maximized, and the corresponding marginal profit is zero (i.e. the slope of the profit line is horizontal).



3. Given that:

Quantity of Bikes	TC	MC	Var Costs	AVC	ATC
0	2000	2000	0	0	0
1	2500	500	500	500	2500
2	2800	300	800	400	1400
3	3000	200	1000	333	1000
4	3160	160	1160	290	790
5	3340	180	1340	268	668
6	3540	200	1540	257	590
7	3780	240	1780	254	540
8	4080	300	2080	260	510
9	4410	330	2410	268	490
10	4770	360	2770	277	477
11	5190	420	3190	290	472
12	5760	570	3760	313	480



(b) Explain shape of MC curve.

Marginal cost is the increase in total cost resulting from the production of an additional unit of output. At low output levels, the MC curve decreases with increases in output, but after it reaches a minimum, it increases with further increases in output.

The reason for this behavior is found in the law of diminishing marginal returns. MC and marginal product of the variable input are inversely related. Since MP generally increases, attains a maximum and then declines with increases in output, marginal cost normally decreases, attains a minimum, and then increases.

Notes beyond the textbook material:

By definition,

MC= ΔTC / ΔQ = ΔTVC / ΔQ

(because ΔTC = ΔTVC + ΔTFC,

and ΔTFC = 0)

ΔTVC = P * ΔV (change in quantity of variable input resulting from ΔQ)

Thus, MC = P * (ΔV / ΔQ) = P * (1 / MP)

(c) Is this a long run situation? **No, because we have a fixed cost $20,000, which is unalterable for the time period in question. In the long run all factors of production are variable.**

4. The following waffle iron data are from Al's Waffle World of Pittsboro.

Output	0	1	2	3	4	5	6
Total Revenue	0	15	25	33	40	45	48
Total Costs	10	17	22	29	40	53	68

1. If the firm maximizes profits, how many waffle irons should be produced?

Output	**Total Revenue**	**Total Costs**	**Marginal Revenue**	**Marginal Costs**	**Average Revenue**	**Average Cost**
0	0	10	0	10	n/a	n/a
1	15	17	15	7	15	17
2	25	22	10	5	13	11
3	33	29	**8**	**7**	11	10
4	40	40	7	11	10	10
5	45	53	5	13	9	11
6	48	68	3	15	8	11

2. What are the fixed costs? **Fixed costs = $10**

   If fixed costs increase by $3, how many waffle irons should be produced? By $5? **Regardless of the level of fixed costs the optimal output of waffle irons is 3. This is because we produce where MR = MC, and MC does not depend on fixed costs.**

   (MC = ΔTC / ΔQ = ΔTVC / ΔQ because ΔTC = ΔTVC + ΔTFC, and ΔTFC = 0)

			Fixed Cost=13		Fixed Cost=15	
Output	**Total Revenue**	**Marginal Revenue**	**Total Costs**	**Marginal Costs**	**Total Costs**	**Marginal Costs**
0	0	0	13	13	15	15
1	15	15	20	7	22	7
2	25	10	25	5	27	5
3	**33**	**8**	**32**	**7**	**34**	**7**
4	40	7	43	11	45	11
5	45	5	56	13	58	13
6	48	3	71	15	73	15

3. What price should the firm charge assuming it produces at the optimal level of output.

   In order to know what price to charge at the optimal level of output we have to know the demand curve. The demand curve tells us what price to charge to induce consumers to buy the amount of product the firm wants to buy and sell (i.e the profit-maximizing output where MC=MR). The price corresponding to the profit-maximizing output is called the profit-maximizing price.

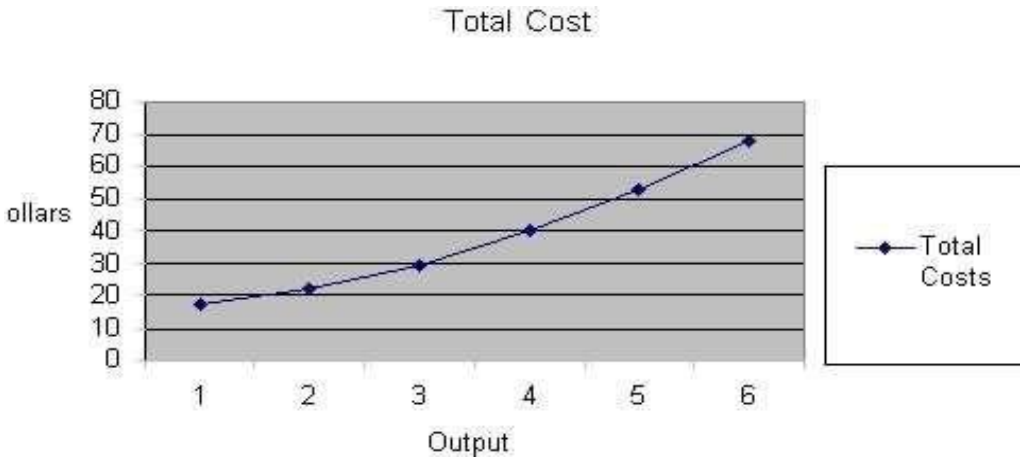
   We can calculate total revenue directly from the demand curve because by the definition

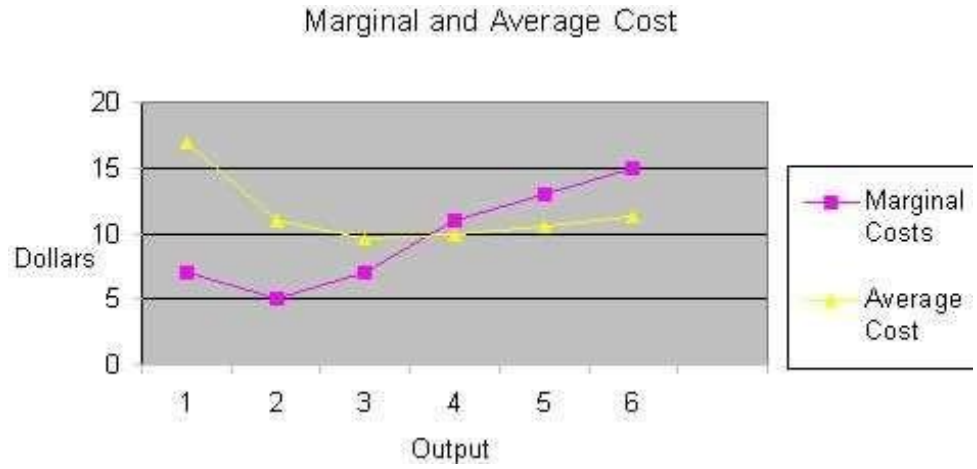
   TR = P x Q

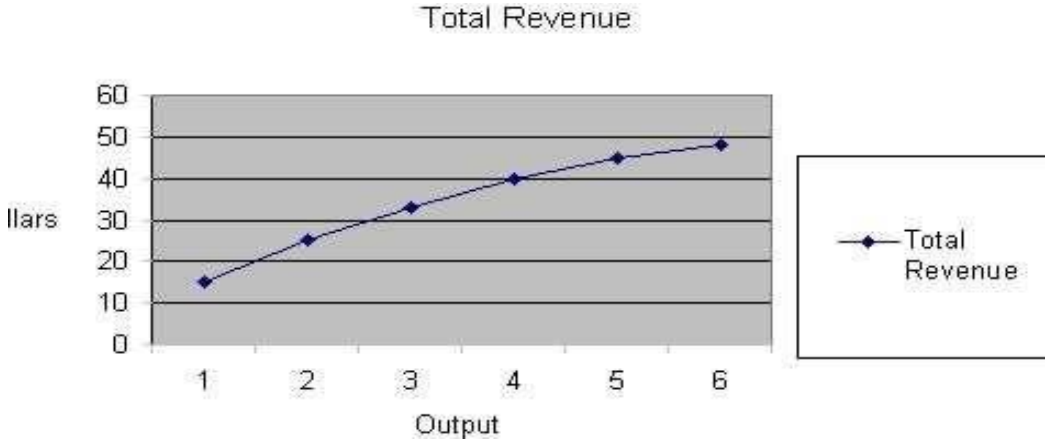
   Thus, if we know the profit-maximizing output (Q) and the total revenue it generated, we can calculate the corresponding profit-maximizing price:

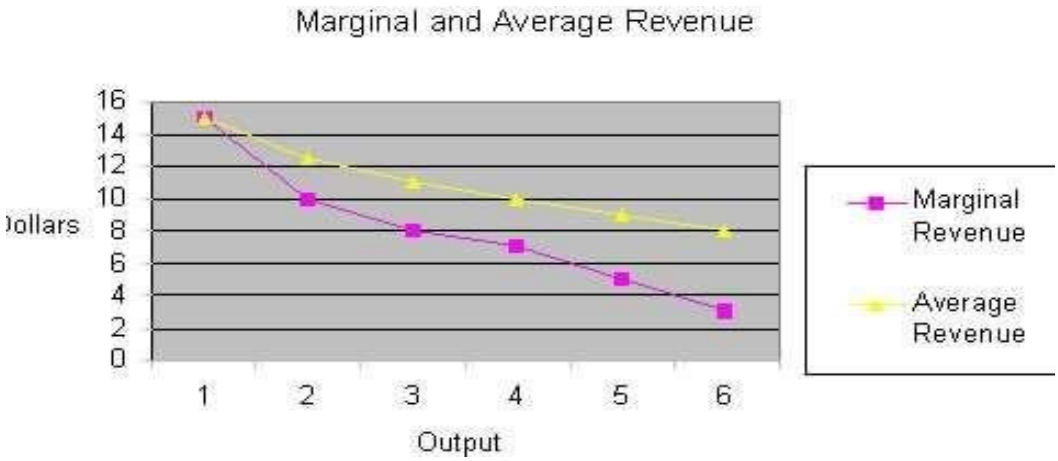
   P = TR / Q = 33 / 3 = 11

4. Graph the total cost, marginal cost and average cost curves. Also, draw the total revenue, marginal revenue and average revenue curves.







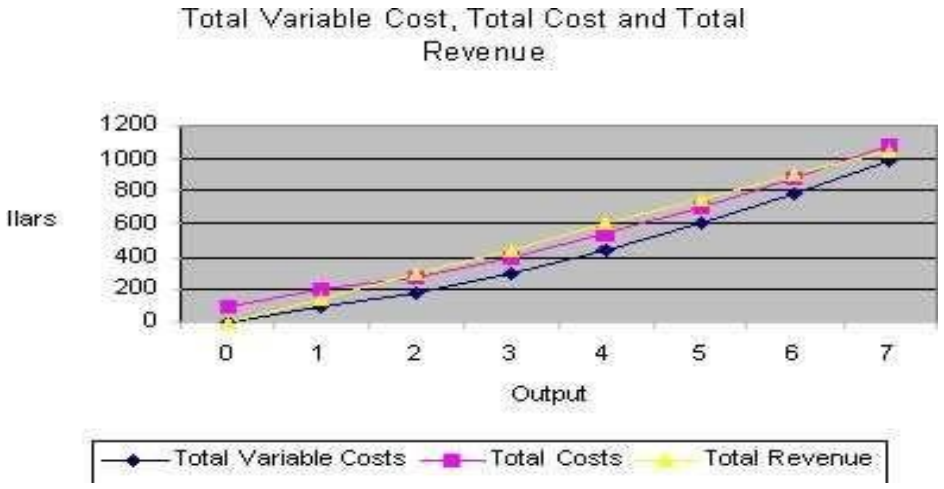


5. a) Assuming the market price of the firm's product is $150, fill in the remaining columns.

Output	Total Fixed Costs	Total Variable Costs	Total Costs	Total Revenue	Profit or (Loss)	Marginal Cost	Marginal Revenue
0	100	0	100	0	-100	na	na
1	100	100	200	150	-50	100	150
2	100	180	280	300	20	80	150
3	100	300	400	450	50	120	150
4	100	440	540	600	**60**	**140**	**150**
5	100	600	700	750	50	160	150
6	100	780	880	900	20	180	150
7	100	980	1080	1050	-30	200	150

b) Profit is maximized at an output of____**4**_____.

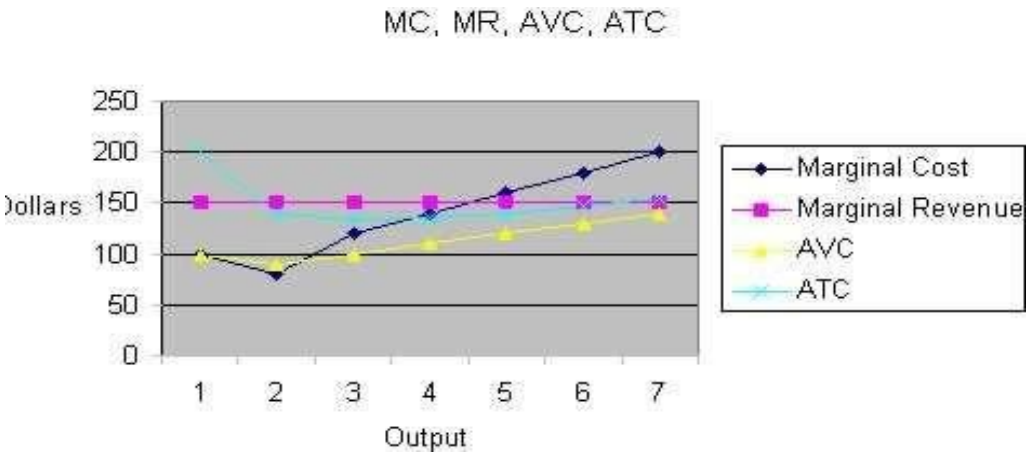
c) Draw total variable cost, total cost and total revenue. Show profit maximizing output.



d) Using the information provided above, fill in the following table.

Output	Marginal Cost	Marginal Revenue	AVC	ATC	Profit
0	na	na	na	na	-100
1	100	150	100	200	-50
2	80	150	90	140	20
3	120	150	100	133	50
4	**140**	**150**	110	135	**60**
5	160	150	120	140	50
6	180	150	130	147	20
7	200	150	140	154	-30

e) Draw AVC, ATC, MC and MR curves.



f) Profit is maximized by producing____**4**____units of output. Profit is $___**60**_____. At the point of maximum profit___**MC=140**_____**(roughly)** equals___**MR=150**_____.

g) Suppose the firm's total fixed cost increases from $100 to $200, other things being equal. Should the firm continue to produce in the short run. If so, how much should it produce? Explain.

The firm should continue to produce and minimize its loss by producing 4 units of output.

Output	Total Fixed Costs	Total Variable Costs	Total Costs	Total Revenue	Marginal Cost	Marginal Revenue	AVC	ATC	Profit
0	200	0	200	0	na	na	na	na	-200
1	200	100	300	150	100	150	200	300	-150
2	200	180	380	300	80	150	140	190	-80
3	200	300	500	450	120	150	133	167	-50
4	200	440	640	600	**140**	**150**	135	160	**-40**
5	200	600	800	750	160	150	140	160	-50
6	200	780	980	900	180	150	147	163	-80
7	200	980	1180	1050	200	150	154	169	-130