EE211 Section 1
Homework 3 Answers
Explain your answers with graph in details.

Mankiw, N.G., (2023) Principles of Microeconomics, 10th ed., Cengage, (ISBN-13: 978-981-5119-30-5)

Chapter 14
Problems and Applications # 1, 3, 4, 6, 9, and 10.

1.

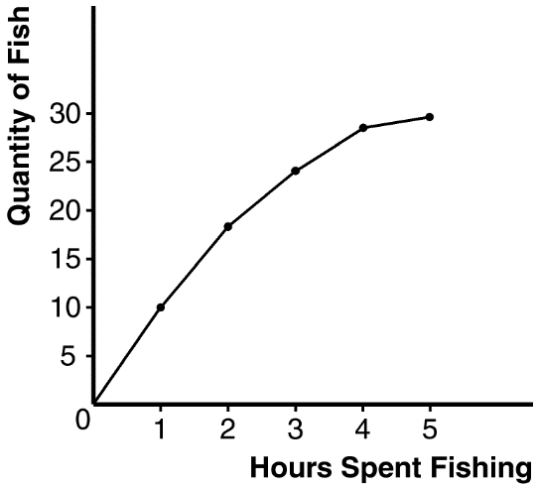
a. opportunity cost
b. average total cost
c. fixed cost
d. variable cost
e. total cost
f. marginal cost.

3.

a. The following table shows the marginal product of each hour spent fishing:
b.

Hours	Fish	Fixed Cost	Variable Cost	Total Cost	Marginal Product
0	0	$10	$0	$10	---
1	10	10	5	15	10
2	18	10	10	20	8
3	24	10	15	25	6
4	28	10	20	30	4
5	30	10	25	35	2

c. Figure graphs the fisherman's production function. **The production function becomes flatter as the number of hours spent fishing increases**, illustrating **diminishing marginal product.**



d. The table shows the fixed cost, variable cost, and total cost of fishing. Figure shows the fisherman's total-cost curve. It has an upward slope because catching additional fish takes additional time. **The curve is convex because there are diminishing returns to fishing time because each additional hour spent fishing yields fewer additional fish**.

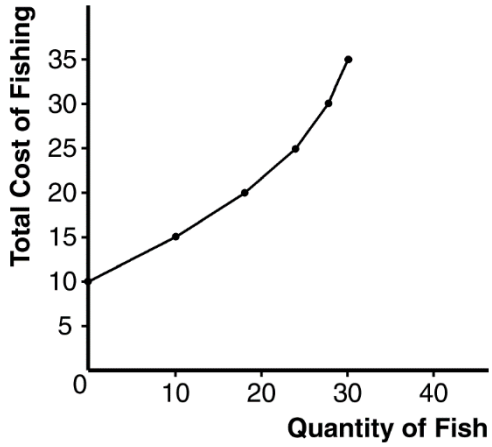


Figure B

4. Here is the completed table:

Workers	Output	Marginal Product	Total Cost	Average Total Cost	Marginal Cost
0	0	---	$200	---	---
1	20	20	300	$15.00	$5.00
2	50	30	400	8.00	3.33
3	90	40	500	5.56	2.50
4	120	30	600	5.00	3.33
5	140	20	700	5.00	5.00
6	150	10	800	5.33	10.00
7	155	5	900	5.81	20.00

a. See the table for marginal product. **Marginal product rises at first, then declines because of diminishing marginal product**.
b. See the table for total cost.
c. See the table for average total cost. Average total cost is U-shaped. When quantity is low, average total cost declines as quantity rises; when quantity is high, average total cost rises as quantity rises.
d. See the table for marginal cost. **Marginal cost is also U-shaped, but rises steeply as output increases. This is due to diminishing marginal product**.
e. When marginal product is rising, marginal cost is falling, and vice versa.
f. When marginal cost is less than average total cost, average total cost is falling; the cost of the last unit produced pulls the average down. When marginal cost is

greater than average total cost, average total cost is rising; the cost of the last unit produced pushes the average up.

6.

a. The fixed cost is $300, because fixed cost equals total cost minus variable cost. At an output of zero, the only costs are fixed cost.

b.

Quantity	Total Cost	Variable Cost	Marginal Cost (using total cost)	Marginal Cost (using variable cost)
0	$300	$0	---	---
1	350	50	$50	$50
2	390	90	40	40
3	420	120	30	30
4	450	150	30	30
5	490	190	40	40
6	540	240	50	50

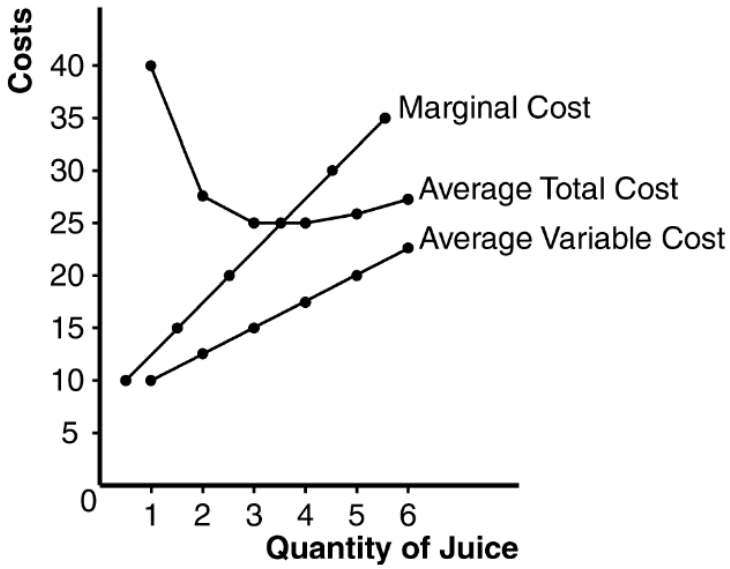
Marginal cost equals the change in total cost for each additional unit of output. It is also equal to the change in variable cost for each additional unit of output. This relationship occurs because total cost equals the sum of variable cost and fixed cost and fixed cost does not change as the quantity changes. Thus, as quantity increases, the increase in total cost equals the increase in variable cost.

9.

a. The following table shows average variable cost (*AVC*), average total cost (*ATC*), and marginal cost (*MC*) for each quantity.

Quantity	Variable Cost	Total Cost	Average Variable Cost	Average Total Cost	Marginal Cost
0	$0.00	$30.00	---	---	---
1	10.00	40.00	$10.00	$40.00	$10.00
2	25.00	55.00	12.50	27.50	15.00
3	45.00	75.00	15.00	25.00	20.00
4	70.00	100.00	17.50	25.00	25.00
5	100.00	130.00	20.00	26.00	30.00
6	135.00	165.00	22.50	27.50	35.00

b. Figure shows the three curves. The marginal-cost curve is below the average-total-cost curve when output is less than four and average total cost is declining. The marginal-cost curve is above the average-total-cost curve when output is above four and average total cost is rising. The marginal-cost curve lies above the average-variable-cost curve.



10. The following table shows quantity (*Q*), total cost (*TC*), and average total cost (*ATC*) for the three firms:

	Firm A		Firm B		Firm C	
Quantity	***TC***	***ATC***	***TC***	***ATC***	***TC***	***ATC***
1	$60.00	$60.00	$11.00	$11.00	$21.00	$21.00
2	70.00	35.00	24.00	12.00	34.00	17.00
3	80.00	26.67	39.00	13.00	49.00	16.33
4	90.00	22.50	56.00	14.00	66.00	16.50
5	100.00	20.00	75.00	15.00	85.00	17.00
6	110.00	18.33	96.00	16.00	106.00	17.67
7	120.00	17.14	119.00	17.00	129.00	18.43

Firm A has economies of scale because average total cost declines as output increases.

Firm B has diseconomies of scale because average total cost rises as output rises.

Firm C has economies of scale from one to three units of output and diseconomies of scale for levels of output beyond three units.