

Problem Set #6

Consider the following product and cost schedule for a representative firm.

Product Functions				Cost Functions					
Labor	Output	MP_L	AP_L	FC	VC	TC	MC	AVC	ATC
0	0	-----		200	0		-----		
1	10			200	100				
2	25			200	200				
3	45			200	300				
4	60			200	400				
5	70			200	500				
6	75			200	600				
7	75			200	700				
8	70			200	800				

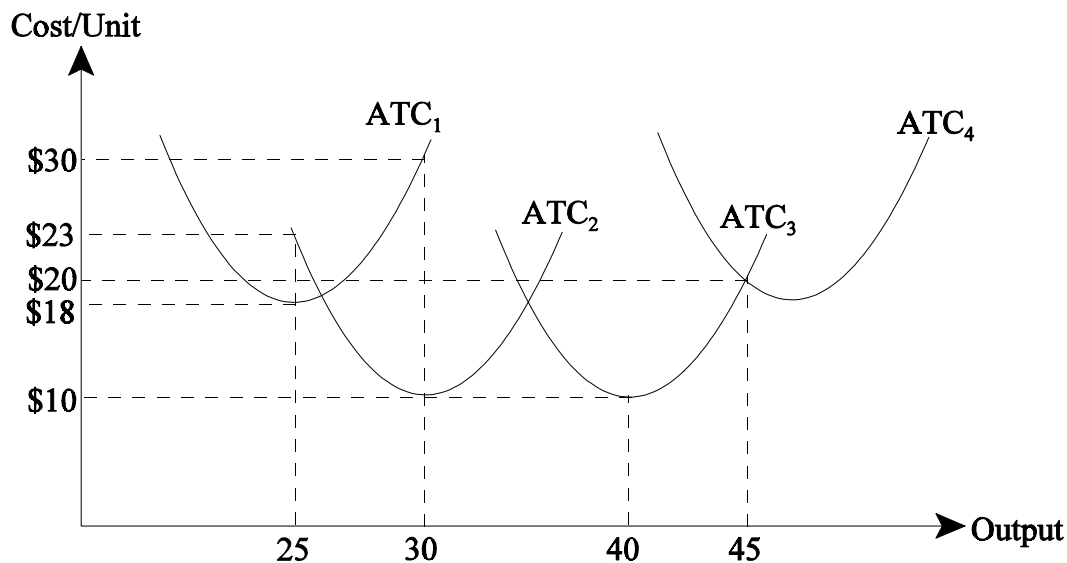
Use a spreadsheet program for the graphs in questions 1-9.

Product Curves

- (1) Graph total product. Indicate the range over which increasing, decreasing and negative returns to labor occur.
- (2) Calculate the marginal product of labor (MP_L).
- (3) Indicate the range over which increasing, decreasing and negative returns to labor occur.
- (4) Calculate the average product of labor (AP_L).
- (5) Graph the marginal and average products of labor together on the same graph.

Cost Curves

- (6) Calculate total cost (TC).
- (7) Graph the total cost curve. Indicate the range over which increasing and decreasing returns to labor occur.
- (8) Calculate marginal cost (MC), average variable cost (AVC) and average total cost (ATC).
- (9) Graph marginal, average variable and average total cost functions on the same graph. Note: Graph only the non-negative values.
- (10) At what output is the average product of labor (AP_L) equal to the marginal product of labor (MP_L)?
- (11) What are the implications for the average product of labor when $AP_L = MP_L$?
- (12) What is total product when the MP_L is maximized?
- (13) What is total product when the MP_L is zero?
- (14) Assuming a constant price, how many workers should be hired if the firm wants to maximize total revenue?
- (15) At the output at which the marginal product of labor is maximized, what is happening to marginal cost?
- (16) At what output is marginal cost equal to average total cost? What are the implications for average total cost of the previous question?
- (17) At what output is marginal cost equal to average variable cost? What are the implications for average variable cost of the previous question?
- (18) What is the per unit cost of producing 60 units of output?
- (19) What is the per unit labor cost of producing 60 units of output?
- (20) What is the per unit fixed cost of producing 60 units of output?



Suppose that a firm has four possible scales of production. Figure One shows the four short run average total cost curves for the respective firm sizes represented by ATC_1 through ATC_4 .

- (21) Which scale of production is best when output, $Q = 25$? Based on your previous answer, what is the per unit cost of producing 25 units?
- (22) Which scale of production is best when output, $Q = 30$? Based on your previous answer, what is the per unit cost of producing 30 units?
- (23) Which scale of production is best when output, $Q = 40$? Based on your previous answer, what is the per unit cost of producing 40 units?
- (24) Which scale of production is best when output, $Q = 45$? Based on your previous answer, what is the per unit cost of producing 45 units?
- (25) Identify the long run average cost curve from Figure One.
- (26) Over what output range (approximately) on the long run average cost curve are increasing returns to scale illustrated?
- (27) Over what output range (approximately) on the long run average cost curve are decreasing returns to scale illustrated?
- (28) Over what output range (approximately) on the long run average cost curve are constant returns to scale illustrated?