Economics 101
Spring 2019
Homework #4
Due Thursday, April 11, 2019

Directions:

- The homework will be collected in a box labeled with your TA's name **before** the lecture.
- Please place **your name, TA name, and section number** on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade.
- Please **staple** your homework: we expect you to take care of this prior to coming to the large lecture. You do not need to turn in the homework questions, but your homework should be neat, orderly, and easy for the TAs to see the answers to each question.
- Late homework will not be accepted so make plans ahead of time.
- Show your work. Good luck!

Part I: Production Costs

1. The following table gives cost information for a firm. Assume that labor is paid a constant wage and capital is paid a constant price, i.e., our firm is a price-taker both in the labor and capital markets.

L	K	Q	VC	FC	TC	AVC	AFC	ATC	MC	MPL
0	10	0		100	100	---	---	---	---	---
1	10	5		100	200					
2	10			100					5	
3	10			100						25
4	10			100						30
5	10			100				6		
6	10			100						5

a. Complete the above table with specific numbers.
b. At what level of output is ATC at its minimum?
c. At what level of labor usage does the law of diminishing returns first occur?
d. At what level of output does marginal cost attain its minimum?
e. When output is equal to zero units, why does the firm still incur costs in the short run? Explain your answer.

Part II: Perfect Competition

2. Suppose there is a perfectly competitive industry with a market demand curve that can be expressed as:

$P = 200 - (1/10)Q$

where P is the market price and Q is the market quantity. Suppose that all the firms in this industry are identical and that a representative firm's total cost is:

$TC = 225 + 5q + q^2$

where q is the quantity produced by this representative firm. The representative firm's marginal cost is:

$MC = 5 + 2q$

a. What is the average total cost for the representative firm?
b. In the long run, how many units will this firm produce and what price will it sell each unit for in this market?
c. What is the total market quantity produced in this market in the long run?
d. How many firms are in the industry in the long run?
e. How do long-run profits change for the firm if demand decreases? Increases?

3. Consider a perfectly competitive industry composed of six identical firms that produce widgets. Suppose you are told that the representative firm has the following cost curves where TC is total cost measured in dollars and q is units of widgets produced by a particular firm:

Total Cost: $TC = 4 + 4q + q^2$
Marginal Cost: $MC = 4 + 2q$

Suppose you also know that the market demand curve is given by the following equation where P is the market price in dollars and Q is the market quantity of widgets:

Market Demand: $P = 19 - (1/2)Q$.

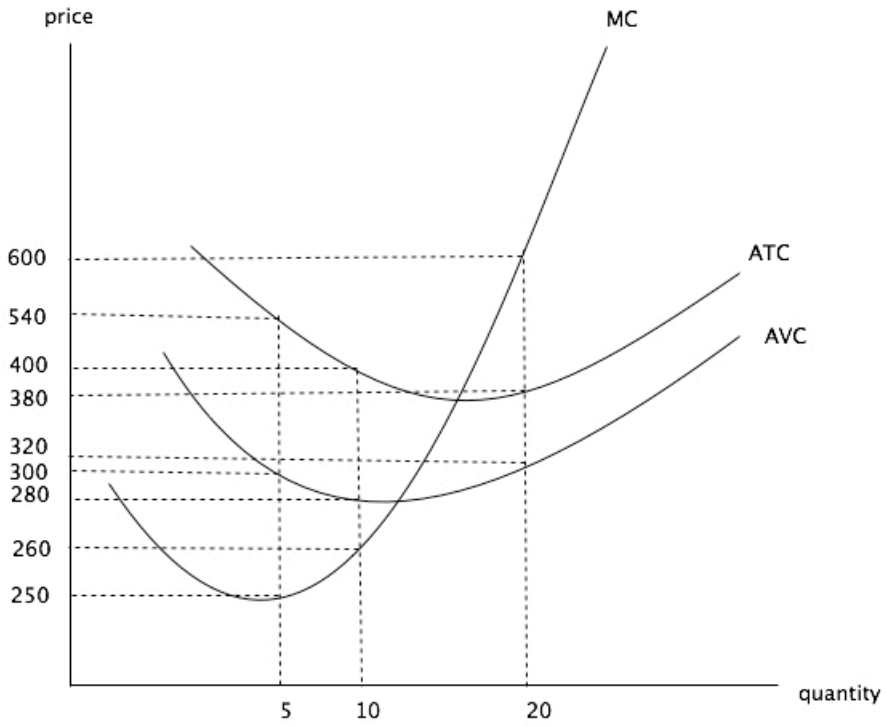
Q represents market quantity and q represents firm quantity.

a. Given the above information write an equation for the market supply curve. Explain how you found this equation.
b. Given the market supply curve you found in (a), calculate the short run market equilibrium quantity and price in this market. How many units of output will the representative firm produce in the short run? Calculate the short-run profits for the representative firm. Explain your work.
c. Given your calculations in (b), will the representative firm produce in the short-run? Explain your answer.
d. Given your answer in (b), what do you predict will happen in the long-run in this industry?
e. Given no changes in the firm's cost curves or the market demand curve, calculate the following and explain how you found your answers:

Long-run equilibrium market price; long-run equilibrium market quantity; level of production by the representative firm and number of firms in industry in the long-run.

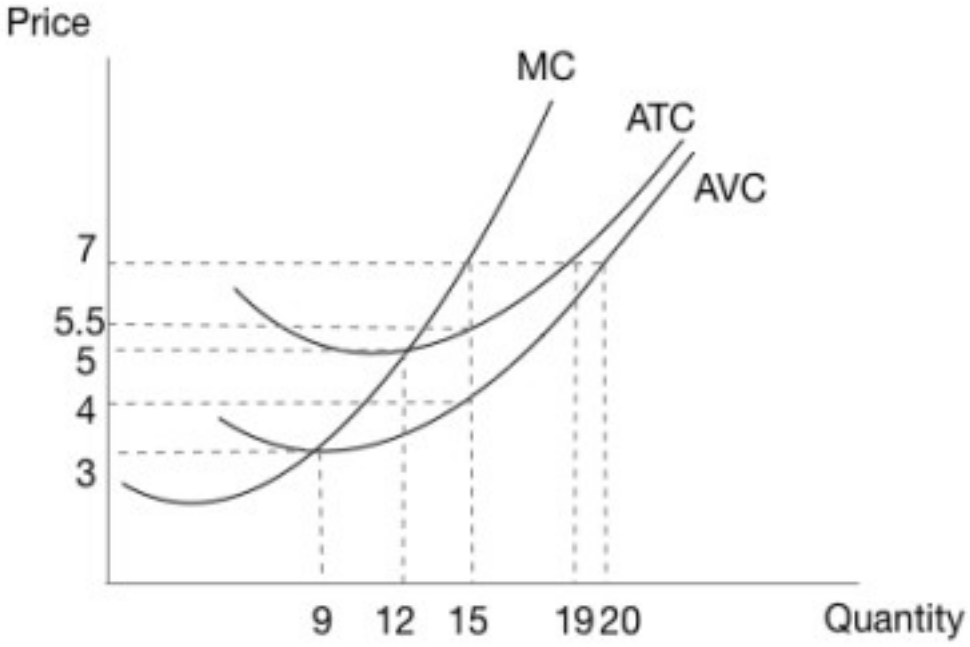
Part III: Interpreting Cost Curves

4. Use the graph below to answer the following questions.



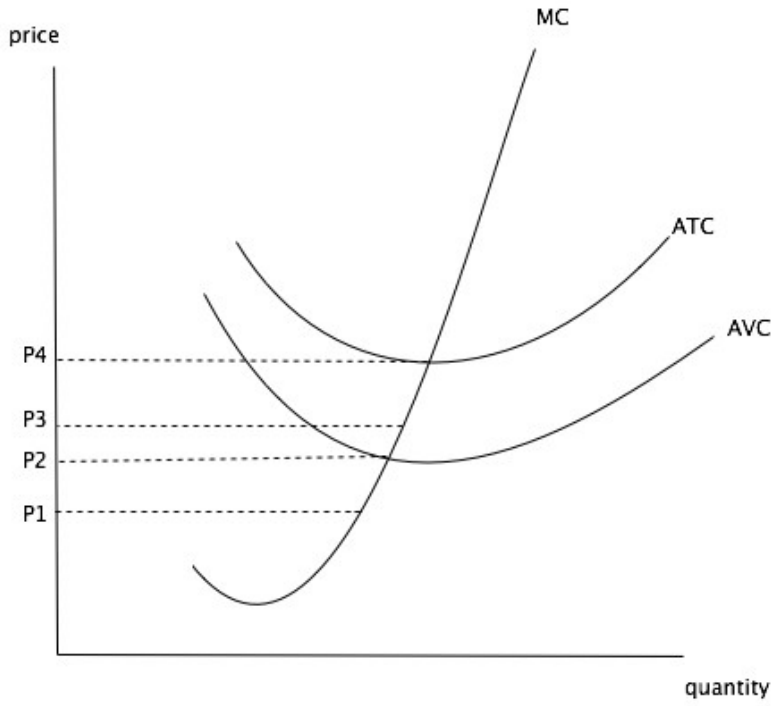
a. Find variable cost, fixed cost, total cost and profits at output levels q = 5, 10 and 20.
b. At which of the output levels (q = 5, 10 and 20) will the firm operate in the short run?
c. At which of the output levels (q = 5, 10 and 20) will the firm operate in the long run?

5. The figure below depicts the cost structure of a t-shirts company in a competitive market.



a. What is the fixed cost for this company?
b. When the price level is $7, what is the profit for this profit-maximizing firm?
c. What are the Breakeven and Shutdown prices for this firm?
d. Assume there are many t-shirts companies in the market that are identical to one another and the market is perfectly competitive. Given this information, what is the long run equilibrium price in this market, and how many t-shirts will each firm produce in the long run?

6. Use the graph below to answer the following questions.



a. How can you find the supply curve for a firm in the short run?
b. For which price range does the firm produce but incur losses in the short run? Why does the firm continue operating in the short run, even though it is making negative profits? Show it mathematically.
c. For what prices does the firm produce in the long run?