Economics 101
Fall 2017
Homework 5
Due:12/12/17

Directions:
· The homework will be collected in a box 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.
· Late homework will not be accepted so make plans ahead of time.
· Show your work. Good luck!

**Please realize that you are essentially creating "your brand" when you submit this
homework. Do you want your homework to convey that you are competent, careful, and
professional? Or, do you want to convey the image that you are careless, sloppy, and
less than professional? For the rest of your life you will be creating your brand: please
think about what you are saying about yourself when you submit any work for someone
else.**

Part I: Production Theory (Questions from the last Homework)

1) Bob owns a sausage business in Madison. The quantity of sausages that his company can
produce (q) depends on the amount of capital (K) and labor (L) that he employs. The units of
capital represent the number of machines his business owns. The units of labor represent the
number of employees he hires. His costs of employing the capital and labor are given in
dollars. The following table describes the production and costs for given levels of K and L.

K	L	q	FC	VC	TC	AFC	AVC	ATC	MC	MPL
3	0	0	$30		$30	-	-	-	-	-
3		4	$30						$7.5/unit of output	2 units of output/unit of labor
3	3	12								
3		15			$90					
3	6	20								
3	7	22								
3		25		$135						
3	10	26								

a. How much does each machine (unit of K) cost?

b. How much does each unit of labor cost? (Assume the wage is constant.)

c. Fill out all the other missing pieces of information in the table. Do calculations to three places past the decimal where necessary.

d. As Bob hires more workers, does the marginal product of those workers increase? Does the marginal product of labor begin to diminish at some point?

e. Can we tell whether Bob's business will be operating in the short run? What about in the long run? What piece of information do we still need to learn to know for sure about the answers to these two questions?

f. What is the Shutdown price for Bob?

g. What is the Breakeven Price for Bob?

Part II: Perfect Competition

2) The figure below depicts the cost structure of a t-shirts company in a competitive market.
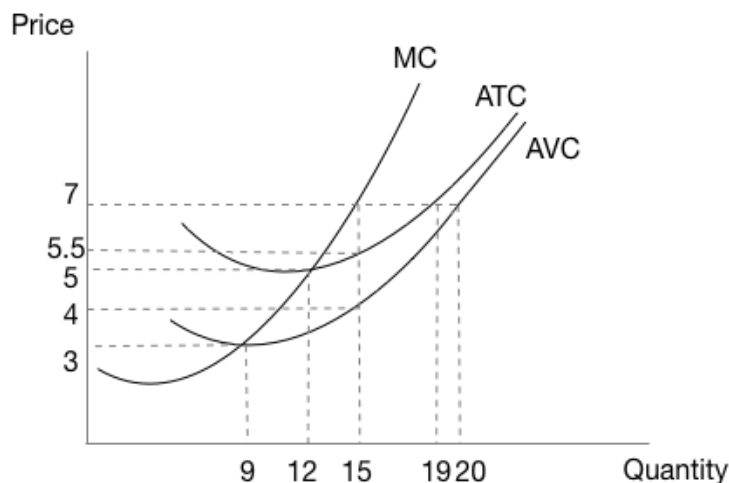
a. What is the fixed cost for this company?

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?

Part III: Short-Run and Long-Run

3) Consider a perfectly competitive market with a market demand curve given by equation P = 4000 - 2Q where P is the price per unit and Q is the total quantity in the market. Each firm in the market has the same total cost given by TC = 242 + 128q + $2q^2$ where q is the quantity produced by a representative firm. The Marginal Cost for the representative firm is given by the equation MC = 128 + 4q.

Consider the Short-Run first. Suppose you know that the current short run price in the market is $200 per unit.

a. What is the market quantity given this short run price?

b. What is the representative firm's level of production in this market?

c. What is the representative firm's level of profits in the short-run given this market price?

d. Describe the difference between short run and long run economic profits for the firm and give an explanation for why there is a difference between these two economic profits.

e. Rounding to the nearest whole number, how many firms are operating in the short-run in this market?

Suppose now the market is operating in the Long Run. Assume the market demand stays at its initial level.

f. What is the break-even price in the long-run for a representative firm in this industry?

g. What is the long-run market quantity in this market?

h. How many firms will be in this industry in the long-run?

Part IV: Monopoly

4) Suppose there is a monopolist in the market for cheese curds. The monopolist's marginal cost equation is given by MC = 2 + 2Q where Q is the quantity of units of cheese curds. The demand curve is given by P = 10 - Q where P is the price per unit of cheese curds.

a. What is the monopolistic price and quantity in the cheese curd market? Show how you found your answer. Find the monopolist's total revenue. Calculate the value of consumer surplus in this market.

b. Suppose the monopoly acted as a competitive firm. Find the price and quantity it would sell. Calculate the value of consumer surplus and the value of producer surplus. Note: these numbers are a trifle "ugly": do the math with fractions and it is okay for you to have improper fractions in your answers.

c. Suppose this monopolist implements a first degree price discrimination to increase the monopolist's profits. Calculate the profit when this monopolist practices first degree price discrimination. Again, the numbers are a trifle ugly here: stick with fractions but remember to include your units of measurement!

5) Consider a monopolist that sells its product to two different types of buyers. Assume initially that the monopolist is unable to distinguish whether a particular buyer belongs to group A or group B (the two types of buyers). The monopolist knows the following information where P is the price per unit of output, Qa is the quantity provided to group A, and Qb is the quantity provided to group B.

Demand for product from group A: $P = 100 - Qa$
Demand for product from group B: $P = 50 - (1/2) Qb$
Marginal Cost = MC = \$10 per unit of output: MC = 10
The average total cost of producing a unit of output is \$10 per unit and constant. There are no fixed costs.

a. Find the market demand curve for this monopolist. This market demand curve will be the horizontal summation of the two group demand curves. Provide all equations and ranges needed to describe this market demand curve. Draw an image that include three horizontally oriented graphs: the first graph the demand of group A, the second graph the demand of group B, and the third graph the market demand curve.

b. If this firm acts as a single price monopolist, what price will the monopolist charge and how many units will the monopolist produce? What will be the monopolist's profit? Show how you found your answer. The numbers here may not be pretty: it is okay to use improper fractions and I would encourage you to do the work with fractions rather than with decimals!

c. Now, suppose this monopolist can distinguish whether a particular buyer is in group A or group B. That is, this monopolist decides to practice third degree price discrimination. How many units in all will this monopolist produce now? What price will buyers in group A pay and how many units will group A get? What price will buyers in group B pay and how many units will group B get? What will be the value of profits for the firm from group A? What will be the value of profits for the firm from group B? What will be the total value of profits for the third-degree price discriminator? Show your work, but enter your findings in the following table.

Price for group A	
Quantity for group A	
Price for group B	
Quantity for group B	
Profit from sales to group A	
Profit from sales to group B	
Total profit for third degree price discriminators	

d. Does this firm benefit from practicing third degree price discrimination? Write a short paragraph and offer an argument pro or con with respect to this question. Use data to support your position.

Part V: Natural Monopoly

6) There is a natural monopoly in the market for minions driven by Doctor Gru. The marginal cost is constant and equals $10 per unit of output. The Demand in the market is given by the equation $P = 100 - Q$ where P is the price per unit and Q is the market quantity. The marginal revenue equation for this natural monopoly is given by the equation $MR = 100 - 2Q$ (pause and see if you understand why this is the equation for the marginal revenue curve for this firm). Average total cost equals $25 per unit of output at a quantity of 45 units of output and the average total cost curve intersects the Demand curve at the quantity of 80 units of output and a ATC value of $20 per unit of output.

a. Suppose the natural monopoly is not regulated. Find the price, total output and profit for this natural monopoly when it is not regulated.

b. Suppose now that the monopoly is regulated so that it breaks even. Find the price, total output and profit of the natural monopoly.

Part VI: Game Theory

7) Consider the following two-player game. Bart and Liza, who are good friends, are each choosing whether they want to go to the doughnut store or the ice-cream store. Each will make their choice based upon which choice gives them the greatest utility.

a. Find the dominant strategies in the following game. Bart's utility is listed first and Liza's second in each cell of the payoff matrix.

		Liza	
		Ice-Cream Store	Doughnut Store
Bart	Ice-cream Store	3,3	4,6
	Doughnut Store	8,2	0,8

b. Find the dominant strategies for each player in the following game. Bart's utility is listed first and Liza's second in each cell of the payoff matrix.

		Liza	
		Ice-Cream Store	Doughnut Store
Bart	Ice-cream Store	10,3	4,6
	Doughnut Store	8,2	0,0

c. Find the dominant strategies for each player in the following game. Bart's utility is listed first and Liza's second in each cell of the payoff matrix.

	Liza

		Ice-Cream Store	Doughnut Store
Bart	Ice-cream Store	3,8	2,3
	Doughnut Store	8,2	0,8

d. Find the dominant strategies for each player in the following game. Bart's utility is listed first and Liza's second in each cell of the payoff matrix. There is now a third option for both Bart and Liza: they can go to the Apple Store.

		Liza		
		Ice-cream Store	Doughnut Store	Apple Store
Bart	Ice-cream Store	6,1	40,9	5,10
	Doughnut Store	3,15	35,17	0,19
	Apple Store	0,10	7,12	3,14

Part VII: Externality

8) a. Consider the first year PhD office. It is shared by 25 first-year PhD candidates. The office has a big ping-pong table. There is a Ping-Pong tournament going on in the office. Describe the positive and negative externalities related to the situation in the first year PhD office.

b. Suppose the UW Stadium holds games every weekend. Since matches are between different teams from different universities across the country, the number of people coming to see the game is large. Describe the externalities (positive and negative) related to holding the games in Madison.

9) Consider a market where a good is produced in such a way that it generates significant pollution. Currently the companies producing the good do not pay the cost of this pollution that they create: for example, imagine that the companies create really toxic water that they simply discharge into the economy's water supply. This market can be described by the following equations:

Marginal Social Benefit Curve (MSB): $P = 1000 - 3Q$

Marginal Private Cost Curve (MPC): $P = 100 + 2Q$

Externality Cost per unit of the good produced = $100 per unit

a. Given the above information, how much of this good will be produced in this market and what price will the good sell for? What is the total cost of the externality generated by this good to this economy? Show your work.

b. If this market were regulated so that the externality was internalized, that is, if the companies had to cover all of their costs of production including pollution, how many units of the good would be produced (the socially optimal amount of the good)? What price would the product sell for under these circumstances?

c. If the government levied an excise tax in order to internalize this externality, what would be the optimal amount per unit for this excise tax?

d. Quantity the deadweight loss (DWL) to society from having this market fail to correct the externality. Show your work.

10) Consider a market composed of two individuals: Bob and Sue. They both enjoy public parks and recognize that public parks are a good example of a public good. You have the following information about Bob and Sue's demands for this good and the cost of providing this good:

Bob's demand for public parks: P = 100 - 2Q
Sue's demand for public parks: P = 60 - 2Q
Marginal Social Cost (MSC) of providing public parks: MSC = $20 per park

a. What does it mean for a good to be non-rival? Use your own words and provide at least one example of a good that is non-rival.

b. What does it mean for a good to be non-excludable? Use your own words and provide at least one example of a good that is non-excludable.

c. Find the market demand curve (the Marginal Social Benefit, MSB) and the marginal social cost (MSC) for the public good. For the MSB curve, this will require you to vertically sum the two individual demand curves. Draw a diagram with a graph of Bob's demand curve, another graph directly below this for Sue's demand curve, and a third graph directly below this for the market demand curve. For each quantity of the public parks add together the price that Bob is willing to pay and the price that Sue is willing to pay. Once you have gotten the graphs done, then write the equation or equations for the MSB. Provide the relevant ranges if there are multiple equations.

d. Find the socially optimal amount (where MSB = MSC) of public parks. Then determine the price that Bob will pay per park and the price that Sue will pay per park. Show your work.

e. Suppose that the MSC changes to MSC' = $48 per public park. What is the new social optimal amount of public parks? What price will Bob pay per park and what price will Sue pay per park? Show your work.