Economics 101
Spring 2018
Homework #5
Due Thursday, May 3, 2018

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: Perfect Competition

1. You have just graduated, and your first job is as a manager at Widget Co., a company that makes widgets. Your engineer gives you the following table of costs, but, for some reason, he has forgotten to fill in most of it. The per unit cost of labor (the wage) is $10, and the per unit cost of capital is $50.

Q	**K**	**L**	**MPL**	**APL**	**FC**	**VC**	**TC**	**AFC**	**AVC**	**ATC**	**MC**
0	10	0	-	-				-	-	-	-
	10	1									$1
	10			12.5				$20			
35	10	3									
	10					$40				$13.50	
	10						$550				$10

a) Using your knowledge of producer theory, fill in the missing information from the table. (You may need a calculator for some of the entries.) Remember that:

MPL = marginal product of labor = [(change in total product)/(change in total labor)]
APL = the average product of labor = [(total product)/(total labor)]
AFC = average fixed cost = FC/Q
AVC = average variable cost = VC/Q
ATC = average total cost = TC/Q
MC = marginal cost = [(change in total cost)/(change in output)]

b) Suppose the market price of widgets is $1. Using your answers to the previous part, what level of production would you recommend in the short run? *Rigorously justify your answer.*

c) Suppose you do not expect any major price increases in the foreseeable future. From this table, should you be concerned about your long-run job prospects at Widget Co.? Why?

2. Suppose the market for cheese curds is perfectly competitive. The demand curve for cheese curds is given by

$$Q = 600 - 50P$$

Suppliers of cheese curds are all identical and have the following cost structure:

Marginal cost for the representative firm: $MC = 2q$
Total cost for the representative firm: $TC = q^2 + 9$

a) Find the equations for the fixed costs, variable costs, average variable costs, and average total costs for a representative firm. Plot marginal costs, average variable costs, and average total costs for a representative firm on the same graph. Hint: don't be worried if your AVC curve looks a bit strange: we want to keep the math simple here!

b) For what prices would a typical cheese curd producer produce, even in the short run? For what prices would a typical producer produce in the long run?

c) Suppose there are currently 50 producers of cheese curds in the market. Give an equation for the total (short-run) supply of cheese curds in this market. Using this information, find the market equilibrium. What are the short-run profits of a typical producer? Do you expect to see entry or exit in this market in the long run?

d) What is the long-run equilibrium price in this market? How many cheese-curd producers will be in the market in the long run?

Part II: Monopoly

3. Suppose there is a monopolist in the market for pain reliever pills. The monopolist's marginal cost equation is given by $MC = 10 + 2Q$ where Q is the quantity of pills supplied. The monopoly firm's total cost is $TC = 10Q + Q^2$. (Note that there is no fixed cost.) The market demand curve for pain reliver pills is given by $P = 70 - Q$ where P is the price per pill.

a) What is the monopolist price and quantity in the pain reliever pills market? Show how you found your answer. Find the monopolist's total revenue and profit. Calculate the value of consumer surplus in the 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.

c) Suppose this monopolist implements first-degree price discrimination to increase the monopolist's profits. Calculate the profit when this monopolist practices first degree price discrimination.

Part III: Price Discrimination

4. Consider a monopolist that sells flight tickets to two groups of buyers: students and non-students. The monopolist is unable to distinguish whether a particular buyer is a student or not unless the buyer's ID is checked. The monopolist knows the following information where P is the price per flight ticket, Q_s is the quantity of flights demanded by students and Q_{ns} is the quantity of flights demanded by non-students. In this problem assume that there are no fixed costs.

Demand for flight tickets from students: $P = 550 - 2Q_s$

Demand for flight tickets from non-students: $P = 1050 - (1/2)\ Q_{ns}$

Marginal Cost: MC = \$150

a) Suppose by law, one's student ID cannot be checked when booking a flight. Find the market demand curve for this monopolist. This market demand curve will be the horizontal summation of the demand curves from the two groups. Provide all equations and ranges needed to describe the market demand curve. Draw the market demand curve.

b) What is the monopolist price and quantity if the monopolist charges a single price for each flight? What will be the profit for the monopolist? (Assume there is no fixed cost.) Show how you found your answer.

c) Now suppose the government allows the monopolist airline to check the buyer's (student) ID card to determine whether a particular buyer is a student or not. The monopolist now can practice third degree price discrimination. How many flight tickets will this monopolist supply to the market for students and the market for non-students? What prices will students and non-students pay? What will be the profits from each market separately? What would be the total profit? Show how you found your answers to each of these questions.

d) Referring to the answers from b) and c), is this firm better off from practicing third degree price discrimination?

Part IV: Game Theory

5. In the battle of the sexes, a couple argues over what to do over the weekend. Both know that they want to spend the weekend together, but they cannot agree over what they want to do. The man prefers to go to the gym, whereas the woman wants to go to yoga. [1]

Since the couple wants to spend time together, if they go their separate ways, they will receive no utility. If they go either to the gym or to yoga, both will receive some utility from the fact that they're together, but only one of them will enjoy the specific activity. The payoff matrix is listed below where the numbers in each cell represent (utility to the man, utility to the woman):

		WOMAN	
		Gym	Yoga
MAN	Gym	(2,1)	(0,0)
	Yoga	(0,0)	(1,2)

a) Is the choice of the couple choosing different activities an equilibrium given the above information? Explain you answer.

b) Is there any strictly dominant strategy for the man?

c) Is there any strictly dominant strategy for the woman?

d) What's your prediction for the equilibrium outcome of this game?

[1] This is a modified version of the classic battle of the sexes example.

Part IV: Externality

6. Suppose the market demand (the marginal private benefit curve) for vaccinations for the population on an island is given by the equation below where P is the price per vaccination and Q is the number of vaccinations:

Market Demand: $P = 100 - 4Q$

The market supply (the marginal private cost curve) is given by:

Market Supply: $P = Q$

Suppose that vaccination imposes positive externalities on the population of the island. Assume that each person getting vaccinated benefits the population of the island by $20.

a) What is the price and quantity in this market for vaccines assuming that it is a competitive market and that the external benefit is not internalized in the market by either the producers or the consumers of the vaccines in this island?

b) Given the above information, find the marginal social benefit and marginal social cost functions for this market.

c) What is the socially optimal number of people getting vaccinated in this market? That is, if the externality was internalized in this market, what would be the price of vaccines and how many people would be vaccinated? Illustrate your answer with a graph that depicts the MPB, MSB, and MPC curves in a graph as well as the socially optimal price and quantity.

d) Suppose the government would like to intervene in the market to correct this externality. What excise tax or subsidy per unit should the government implement in this market to enable this market to reach the socially optimal outcome? What price will the population pay if the tax/subsidy is implemented? What price will producers receive for the vaccine? Calculate the tax revenue for the government if the government imposes a tax or the cost to the government if the government imposes a subsidy.

e) What is the deadweight loss if the government decides not to intervene in this market?

Part V: Public Good

7. Suppose that three student organizations are interested in holding TA review session for the upcoming Econ101 Final. Each student organization has different values for these TA review sessions. The willingness to pay for each organization is given by the following demand curves where P is the price per hour of TA-led review sessions and Q is the number of hours of TA-led review sessions:

Student Organization A: $P_A = 40 - 5Q$

Student Organization B:$P_B = 30 - Q$

Student Organization C: $P_C = 70 - 2Q$

The cost of providing one hour of a TA-led review session is $20. Hence, the MC of an additional hour of a TA-led review session is MC = $20.

a) Suppose this market is treated as a competitive market. How many hours of review sessions will each organization want to have? How much will each organization contribute or pay for an hour of TA-led review session? Are there any free riders in this market? Explain your answer.

b) Find the aggregate demand for this good if we recognize that it is a public good.

c) What is the socially optimal number of hours of TA-led review sessions? How much should each organization contribute per hour in order to get the socially optimal number of hours of TA-led review sessions? Your answer may be left in fractions and does not need to equal a whole number of hours.