Economics 101
Spring 2019
Homework #5
Due Thursday, May 2, 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: Monopoly and Price Discrimination

1. Because of a patent, the market for a new technology is a monopoly. Suppose the market demand is given by P = 200 – Q and the marginal cost is given by MC = 20 + Q.

a. What is the marginal revenue curve of this monopolist?

b. Graph the demand, marginal revenue and marginal cost curves. Shade the areas of consumer surplus, producer surplus and deadweight loss.

c. What is the socially optimal level of production?

d. What are the consumer and producer surpluses, total surplus and DWL if the market was competitive?

e. What is the monopolist's quantity of production and what price will the monopolist charge?

f. What are the consumer and producer surpluses and the DWL from having a monopolistic market?

g. If the total cost curve is given by TC = 30 + 20Q + (½) Q^2, what is the monopolist's ATC? What is the monopolist's profit? In the long run, can the monopolist stay in business?

2. Wenbo is a monopolist in the market for peppa pig figurines within the economics department. He has the following information, where Q is the quantity of peppa pig figurines and P is the price:

Market Demand: P = 300 – Q
Marginal Cost: MC = 2Q
Total Cost: TC = 2 + Q^2

a. Suppose Wenbo cannot price discriminate. What is the profit maximizing price and quantity for Wenbo? What is Wenbo's profit? What is CS, PS, and DWL? Illustrate this in a clearly labeled graph.

b. Suppose Wenbo is able to perfectly price discriminate (also known as first degree price discrimination). What quantity will Wenbo sell? What will be his profit? What is the CS, PS, and DWL? Illustrate this in a clearly labeled graph.

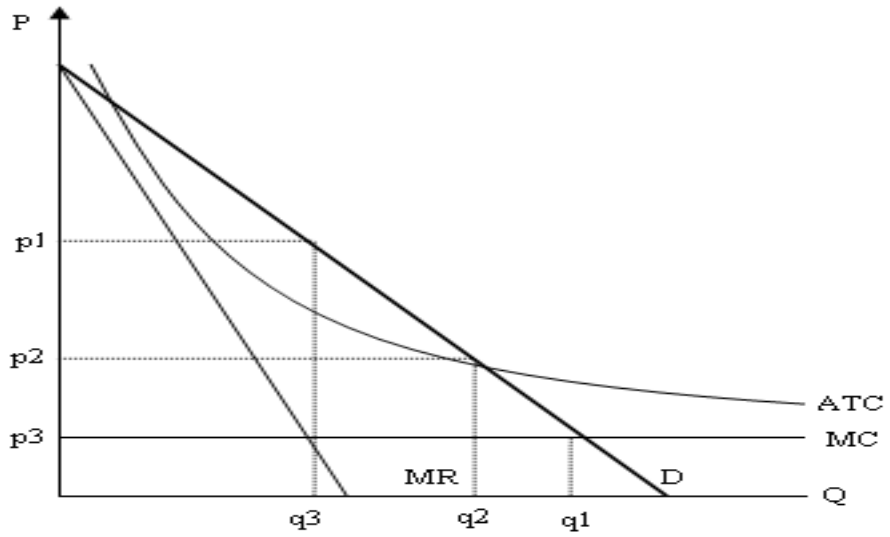
c. Suppose instead Wenbo decides to practice second degree price discrimination: he charges $275 for the first 25 units, and then decreases his price by a certain amount each time he sells another 25 units. What is that amount? What is Wenbo's profit? What is CS, PS, and DWL? Illustrate this in a clearly labeled graph.

d. Comparing (a), (b), and (c), which pricing structure do you think Wenbo prefers? Is this what you expected? Explain.

3. Natural Monopoly.

a. Why do Natural Monopolies arise? Give some examples.

b. On the graph below (next page), what is the price in the unregulated market? What is the price if the government decides to regulate the natural monopoly by setting the price to the competitive market level? Does that regulation work? What is the lowest price at which the natural monopoly is efficiently regulated?



4. A local monopolist likes to practice 3rd-degree price discrimination. The monopolist faces the following demand curves where P is the price per unit of the good and Q is the quantity of units of the good, and has a MC described by the following:

   Demand from Students: $P = 200 - (1/2)Q$
   Demand from Non-student Buyers: $P = 120 - 2Q$
   $MC = \$4$

a. What price will each group face, and what quantity will they purchase? What are the monopolist's profits?

b. Suppose the monopolist is not able to price discriminate. What is the profit maximizing price and quantity? What is his profit? Compare this answer to your answer in part (a).

Part II: Game Theory

5. Consider the following games:

a. April and Erika want to get sushi for dinner this Friday at 6:30 pm to celebrate the end of a great semester. They are debating going to Sushi Express or Muramoto. When Friday rolls around, neither of them remember where they agreed to go. Without contacting each other, they independently decide between the two options. The payoff matrix is shown below, with the left number in each cell referring to April's payoff, and the right number referring to Erika's payoff.

	Erika		
April		Sushi Express	Muramoto
	Sushi Express	1,2	0,-1
	Muramoto	2,-1	3,3

i. Does April have a dominant strategy?

ii. Does Erika have a dominant strategy?

iii. What do you think the outcome of this game will be?

b. Natalia is eating dinner at Sushi Express when she sees Jason enter the restaurant to order take out. Jason also sees Natalia. They both choose between talking or not talking. If both choose to talk, then they eat together in the restaurant and both get a payoff of 0. If Natalia chooses to talk and Jason chooses to not talk, Natalia gets a payoff of -2 and Jason gets a payoff of 1. If Jason chooses to talk and Natalia chooses to not talk, Jason gets a payoff of -3 and Natalia gets a payoff of 1. If both choose to not talk, they both get a payoff of 4. Represent this game in a payoff matrix that resembles the one in part (a).

i. Does Natalia have a dominant strategy?

ii. Does Jason have a dominant strategy?

iii. What do you think the outcome of this game will be?

iv. If we change the payoff Natalia and Jason get from both choosing talk to 3, do you still expect the same outcome of this game? Explain.

Part III: Externality and Public Goods

6. Consider a market where the demand and supply curves are given by the following equations:

    Supply (MPC): $P = (1/2)Q + 20$
    Demand (MPB): $P = 160 – 3Q$
    Externality Cost: additional $14 per unit produced

a. What is the competitive equilibrium, that is, the equilibrium without any government intervention?

b. Is there a positive or negative externality? Why? Write the equations for the MSC and MSB curves.

c. Find the socially optimal solution. Construct a graph with MSC, MPC, MSB, MPB that illustrates this equilibrium.

d. Suppose the government wants to impose a tax to achieve the socially optimal quantity. What should the tax be? Why?

7. Three Econ 101 students, Alvin, Briton, and Charlie would like to hire a tutor to help them review together for the final. Their demands for tutoring are given by the following equations, where Q is the quantity of hours and P is the price per hour:

    Alvin's Demand: $P = 100 – Q$
    Briton's Demand: $P = 120 – 2Q$
    Charlie's Demand: $P = 80 – 4Q$
    The marginal cost of tutoring is constant at $70.

a. Suppose the market is perfectly competitive. Find the quantity demanded by each individual and the price per unit paid. Are there any free-riders?

b. Find the aggregate demand for this public good. Draw the aggregate demand curve, and label any kink points.

c. What is the socially optimal quantity of this public good? How much should each individual contribute?