**Economics 101**

**Spring 2022**

**Homework #5**

**Due 5/5/22**

**Price Discrimination:**

1. Consider a monopoly that has the following information about its market and its cost curves where P is the price of the good and Q is the number of units of the good:

Market Demand: Q = 1000 – 2P

MC = 50

Fixed Cost for the Producer = 100

1. Given the above information, if this producer acts as a single price monopolist, calculate the following:

Profit maximizing quantity =

Profit maximizing price =

Level of profits (remember you will need to adjust this to take into account FC) =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Consumer Surplus = CS =

Producer Surplus) = PS = \_\_\_\_\_\_\_\_\_\_\_\_\_

Deadweight Loss = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Show your work and provide a graph to illustrate your answer.

b. Suppose that this monopolist decides to practice second degree price discrimination. The monopolist decides that it will sell its first 100 units of the good produced for a price of $450 per unit, its next 100 units for a price of $300 per unit, and a final 250 units at $275 per unit. Given this information and the initial information, calculate the following for the monopolist who practices this second degree price discrimination:

Total quantity produced by the second degree price discriminator =

Prices charged by the second degree price discriminator = Level of profits for the second degree price discriminator (remember you will need to adjust this to take into account FC) =

Consumer Surplus in this case of second degree price discrimination = CS’ =

Producer Surplus in this case of second degree price discrimination = PS’ = Deadweight Loss in this case of second degree price discrimination =

Show your work and provide a graph to illustrate your answer.

c. Compare your answers in (a) and (b). Does second degree price discrimination benefit consumers in this case? Explain your answer here and provide evidence to support your answer. Does second degree price discrimination benefit the producer? Explain your answer here and provide evidence to support your answer.

d. Suppose this monopolist practices first degree price discrimination in this market. Compute the following if this monopolist successfully implements first degree price discrimination.

Total amount of the good produced in the market =

PS” with perfect price discrimination =

CS” with perfect price discrimination = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Profit for firm with perfect price discrimination (remember to account for fixed costs here) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

DWL with perfect price discrimination =

Show your work and provide a graph to illustrate your answer.

2. Consider a monopolist who has the following information where P is the price per unit and Q is the number of units of the good:

Demand Curve for Class One Buyers: P = 20 – Q

Demand Curve for Class Two Buyers: P = 16 – Q

MC = Q

TC = 20 + (1/2)Q2

a. Suppose that initially this monopolist cannot distinguish whether a buyer is in Class One or Class Two. Given this information find this monopolist’s market demand curve.

b. Suppose that initially this monopolist cannot distinguish whether a buyer is in Class One or Class Two. Given this information find this monopolist’s profit maximizing quantity if the monopolist acts as a single price monopolist.

c. Suppose that initially this monopolist cannot distinguish whether a buyer is in Class One or Class Two. Given this information find this monopolist’s profit maximizing price if the monopolist acts as a single price monopolist.

d. Suppose that initially this monopolist cannot distinguish whether a buyer is in Class One or Class Two. Given this information find this monopolist’s level of profits if the monopolist acts as a single price monopolist.

e. Now, suppose that the monopolist can distinguish whether a buyer is in Class One or Class Two. The monopolist decides to practice third degree price discrimination. Given this information find the quantity of the good that the monopolist will sell to Class One and the quantity of the good that the monopolist will sell to Class Two. Make sure that the sum of these two quantities is equal to the value you found in (b) for the profit maximizing quantity for the monopolist.

f. Now, suppose that the monopolist can distinguish whether a buyer is in Class One or Class Two. The monopolist decides to practice third degree price discrimination. Given this information find the prices for the good for Class One buyers and Class Two buyers.

g. Now, suppose that the monopolist can distinguish whether a buyer is in Class One or Class Two. The monopolist decides to practice third degree price discrimination. Given this information find the total profit the firm earns when it engages in third degree price discrimination. Does the firm earn greater profits by pursuing this strategy instead of the single price strategy you analyzed in (d)?

**Game Theory**

3. Imagine two drivers, Driver I and Driver II, are driving on a rainy night in opposite directions. There is a narrow bridge in front of the two drivers. The bridge is so narrow that both drivers know that only one vehicle can cross the bridge at a time. The drivers can barely see what’s on the other side of the bridge, but a gleam of light tells each of them there’s another driver on the other side of the bridge facing the same dilemma.

Now let’s suppose if both of the drivers choose to drive onto the bridge then both drivers will get stuck in the middle, which is the worst scenario for both drivers. Each driver will spend 5 minutes backing up to get off the bridge and arrange for who will travel across the bridge first. On the other hand if one of the drivers chooses to wait while the other one

chooses to drive onto the bridge, then the one who drives first across the bridge will gain two minutes on their drive while the driver who has to wait will only lose a minute waiting. If both drivers decide to wait then they will both lose ten minutes time trying to figure out what to do. Assume that both drivers seek to minimize their additional travel time. The detailed payoff matrix is listed below:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Driver II |  |
|  |  | Travel Across Bridge | Wait |
| Driver I | Travel Across Bridge | (-5,-5) | (2,-1) |
|  | Wait | (-1,2) | (-10,-10) |

a. Is the choice of both drivers choosing to wait an equilibrium? Explain your answer.

b. Is there any strictly dominant strategy for Driver I?

c. What is your prediction for the equilibrium outcome of this game?

Suppose you saw that the driver on the other side of the bridge is your uncle who is a well- knowned slow tempo person. He also sees you. So, effectively you are now Driver I and your Uncle is Driver II. You understand your Uncle is always going to wait in this kind of situation so the payoff matrix now becomes:

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Driver II: Your Uncle | |
| Travel Across Bridge | Wait |
| Driver I: You | Travel Across Bridge | (-5,-5) | (2,3) |
| Wait | (-1,2) | (0,3) |

d. Is there a strictly dominant strategy for your uncle?

e. What is your prediction for the equilibrium to this game now?

4. 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 |

1. Does April have a dominant strategy?
2. Does Erika have a dominant strategy?
3. 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).

1. Does Natalia have a dominant strategy?
2. Does Jason have a dominant strategy?
3. What do you think the outcome of this game will be?
4. 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.

**Externalities:**

5. 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

MSC: additional $14

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?

6. Consider the production of a good. At the market provided quantity of the good you are told that the marginal social benefit from consuming this good is less than the marginal social cost of producing this good.

a. Draw a graph that represents this provided information. In your graph be sure to include the marginal private benefit (MPB) curve, the marginal social benefit curve (MSB), and the marginal social cost (MSC) curve. Label the market quantity, Qmarket, as well as the socially optimal quantity, Qsocial optimum, in your graph. If there is an area of deadweight loss label this area as well.

b. Given the above information, does the market left to itself, produce too much or too little of the good? Explain your answer.

**Public Goods:**

7. There are two major department stores at the mall: Sears and JC Penny. They both benefit from the mall security patrol. Assume that the quantity of the mall patrol is Q units and that we can write down the marginal benefits and the total benefits provided by mall security for each store as:

Sears: MPB\_sears = 5 - 0.5Q Total Benefit\_sears = 5Q - 0.25Q2 JC penny: MPB\_JC = 2 - 0.25Q

Total Benefit\_JC = 2Q - 0.125Q2

The marginal cost of hiring one additional unit of mall patrol is always $4. That is MC = 4. Answer the following questions:

a. Assume Sears is the first department store in the mall. How many units of mall patrol will Sears choose to hire? What is the net benefit (its total benefit minus its total cost) to Sears of hiring this amount of mall security?

b. Now JC Penny opens a store in the mall. Notice that the mall security patrols that Sears hired also benefit JC Penny. That is both stores can consume this mall security: mall security is not rival and also is not excludable (JC Penny can benefit from the mall security even when it does not pay for any mall security). Now, that JC Penny is in business at the mall, does JC Penny want to hire any more units of mall security patrols? Explain your answer. What is JC Penny’s net benefit after its decision?

c. Now the leasing manager for the mall is in charge of determining how many mall security units should be hired. The manager will make her decision based upon the total marginal benefits of hiring mall security units. How many units of mall security will she hire? Explain your answer.

d. Suppose the manager charges Sears $3 per unit of mall security patrols and charges JC Penny $1 dollar per unit of mall security patrols. Will the two stores both accept this price?

e. What is the net benefit to the manager of hiring the amount of mall security patrols on the basis of the total marginal benefits of these patrols? What’s the net benefit for both of these two department stores? How does your result compare with parts (a) and (b)?

8.Three Econ 101 students, Alvin, Briton, and Charlie would like to hire a tutor to help them review 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?