

PRINCIPLES OF MICROECONOMICS (ECON 1101 SECTION 056)

ASSIGNMENT #3

Answer Key

1. (15 points) Give two examples of industries that closely conform to the pure monopoly model. Describe how the industries exhibit each of the three defining characteristic of pure monopoly.

Answers vary.

2. (5 points) Give an example of an industry that is not a monopoly. Which of the three defining characteristics of pure monopoly is not satisfied?

Answers vary.

3. (20 points) A combination of copyright restrictions and high sunk costs give a company a monopoly in the historical dissertation database market. Suppose the market demand is given by $P=1000-Q$, and thus $MR=1000-2Q$. Suppose that marginal cost is zero, because an additional user costs the database company nothing. Suppose the fixed cost is 100,000.

(a) Calculate the price and quantity the profit-maximizing monopolist selects if no price discrimination is possible.

$$\begin{aligned}MR &= MC \\1000 - 2Q &= 0 \\1000 &= 2Q \\Q &= 500\end{aligned}$$

To find price, use the market demand function.

$$P = 1000 - Q = 1000 - 500 = 500$$

(b) Calculate the monopolist's profit if no price discrimination is possible.

$$\text{At } Q=500, TR=PQ = 500(500) = 250,000$$

$$TC=TFC+TVC. \text{ Additional units cost nothing, so } TVC = 0$$

$$TC = TFC = 100,000$$

$$\Pi = TR - TC = 250,000 - 100,000$$

$$\Pi = \mathbf{150,000}$$

(c) Calculate the monopolist's profit if it is able to perfectly price discriminate, that is charge everyone their maximum willingness to pay.

Since marginal cost is zero, the monopolists should charge everyone with a maximum willingness to pay greater than zero their maximum willingness to pay. Consumers' maximum willingness to pay is given by the demand function, so the perfect price discrimination profits are the area under the demand curve.

$$TR = \text{base}(\text{height})/2$$

Height is the distance between MC and the demand curve's P-intercept, which is 1000 here.

Base is the quantity at which demand equals MC, which is also 1000 here.

$$TR=1000(1000)/2$$

$$TR=500,000$$

$$\Pi = TR - (TFC+TVC)$$

$$\Pi = 500,000 - 100,000$$

$$\Pi = \mathbf{400,000}$$

4. (20 points) In the early twentieth century, a nearly unregulated monopoly controlled streetcar service in Minneapolis and Saint Paul. Suppose that demand was given by $P=200-0.1Q$.

Suppose that total cost was given by $TC(Q)=15000+80Q+0.1Q^2$ and marginal cost was given by $MC(Q)=80+0.2Q$. The streetcar company could not price discriminate.

(a) Calculate the price and quantity the streetcar company would have selected.

First find marginal revenue (MR). Since the demand is linear, the marginal revenue curve has the same intercept as demand but is twice as steep. Demand is $P=200-0.1Q$, so marginal revenue must be $200-0.2Q$. Next, find the quantity where marginal revenue equals marginal cost.

$$MR=MC$$

$$200-0.2Q = 80+0.2Q$$

$$120-0.2Q = 0.2Q$$

$$120 = 0.4Q$$

$$\mathbf{Q = 300}$$

To find the price the monopoly charges, insert the monopoly quantity into the market demand function.

$$P = 200-0.1(300)$$

$$P = 200-30$$

$$\mathbf{P = 170}$$

(b) Calculate profits.

$$\text{At } Q=300, TR = PQ = 300(170) = 51,000$$

$$\text{At } Q=300, TC = 15000+80(300)+0.1(300^2) = 15000+24000 + 9000 = 48,000$$

$$\Pi = TR-TC = 51,000 - 48,000$$

$$\mathbf{\Pi = 3,000}$$

5. (20 points) A bank and an outlet store are both planning to open new branches in a city. Their profitability depends on both their own location and the location of the other business. In the payoff matrix below, the numbers before comma's are the bank's profits and the numbers after commas are the outlet store's profits.

| | | Outlet store | |
|------|-----------------------|-----------------|----------------------|
| | | Locate downtown | Locate near freeway |
| Bank | Downtown | <u>11</u> , 17 | 8, <u>21</u> |
| | Eastside neighborhood | 7, 12 | 3, <u>20</u> |
| | Near freeway | 5, 10 | <u>9</u> , <u>30</u> |

- (a) Does the bank have a dominant strategy? If so, what is it? **No.**
 (b) Does the outlet store have a dominant strategy? If so, what is it? **Yes, locate near freeway gives the outlet store the highest payoff no matter where the bank locates.**
 (c) Find all Nash Equilibria.

Bank locates near freeway, outlet store locates near freeway (which gives payoffs 9, 30)

6. (20 points) In the payoff matrix below, the numbers before commas are firm 1's profits and the numbers after commas are firm 2's profits.

| | | Firm 2 | | |
|--------|---------------|------------------|-------------------------|------------------|
| | | Low output | Medium output | High output |
| Firm 1 | Low output | 750, 750 | 525, <u>850</u> | <u>350</u> , 750 |
| | Medium output | <u>850</u> , 525 | <u>550</u> , <u>550</u> | 250, 350 |
| | High output | 750, <u>350</u> | 350, 250 | 0, 0 |

- (a) Find all Nash Equilibria.
Only one: Firm 1 selects medium output, Firm 2 selects medium output (which gives payoffs 550, 550)
- (b) For each Nash Equilibrium, list the outcomes that would have given higher profit to both firms.
Both firms would prefer (Low output, Low output) which would give payoff (750,750).