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Important Concepts:

- Natural Monopoly
- Price Discrimination
- Game Theory

Problems

1. Suppose a monopolistic local utility company faces a demand curve given by $P = 120 - 4Q$. Total cost for this firm is given by $TC = 400 + 4Q$, and MC is fixed at \$4 per unit.
   a. Does the technology of a firm represent economies of scale?
   b. What is the fixed cost? Does this indicate high barriers to entry?
   c. What is the socially optimal level of production and price?
   d. Suppose this industry operates as a monopoly. Find the equilibrium price and quantity.
   e. The government, bowing to public pressure to regulate monopolies, decides to *force firms to charge their marginal cost* just like they would in perfect competition. How much will the monopolist produce? What is the profit for this monopolist? Is it sustainable?
   f. Suppose the government instead chooses to *force the monopolist to charge a price equal to their average total cost*, this monopolist will supply 25 units. What will be their profits?

2. Plastic molding has both industrial and dental uses. Consider a monopolist producer of this good with constant marginal cost MC = 4. The demand curves for the two market segments are given below
   Dental users: $P = 100 - 2Q$
   Industry users: $P = 50 - 0.5Q$
   a. If a monopolist can practice third-degree price discrimination, what price will they set in the two markets? What is the consumer surplus for each market?
   b. Now suppose the monopolist cannot price discriminate. Instead, they must charge a single price in both markets. What price will they charge?
   c. Is consumer surplus higher or lower without price discrimination?
   d. (True story) Facing a market like this, one supplier of the plastic molding methyl methacrylate considered mixing arsenic with the product sold to industrial users. You might think about why this could be advantageous to the seller.

3. Anna and Boris went to the state fair together, but now can't find each other. They'd like to meet up, but can go to only one of two events to find the other. They can go to the horse show or to the truck rally. Neither person will enjoy the event if alone, but Anna would prefer the horse show while Boris would prefer the truck rally. This is modeled as a game in the table below

		Boris	
		Horse Show	*Truck Rally*
Anna	*Horse Show*	*2 , 1*	*0 , 0*
	Truck Rally	*0 , 0*	*1 , 2*

   a. Does Anna have a dominant strategy? Does Boris?
   b. What are the equilibria in this game?

Econ 101 Handout 13 Solutions

Question 1

See solutions from handout 12.

Question 2

Plastic molding has both industrial and dental uses. Consider a monopolist producer of this good with constant marginal cost $MC = 4$. The demand curves for the two market segments are given below.

$$\text{Dental users}: \ P = 100 - 2Q$$

$$\text{Industry users}: P = 50 - .5Q$$

a.) Third-degree price discrimination

This is essentially two separate monopolist problems. First, we profit maximize in the dental segment. Find marginal revenue, $MR = 100 - 4Q$
Next, we set $MR = MC$.

$$100 - 4Q = 4$$

$$96 = 4Q$$

$$Q = 24 \Rightarrow P = 100 - 48 = \$52$$

Now, we consider the industrial segment.

$$50 - Q = 4$$

$$46 = Q \Rightarrow P = 50 - .5 \times 46 = \$27$$

Finally, we can calculate consumers surplus.

$$\text{Dental CS} = (100 - 52) \times 24 \times \frac{1}{2} = 24^2 = \$576$$

$$Dental\ PS = 24 \times (52 - 4) = \$1152$$

$$\text{Industrial CS} = (50 - 27) \times 46 \times \frac{1}{2} = 23^2 = \$529$$

$$Industrial\ PS = 46 \times (27 - 4) = \$1058$$

$$Total\ PS = \$2210$$

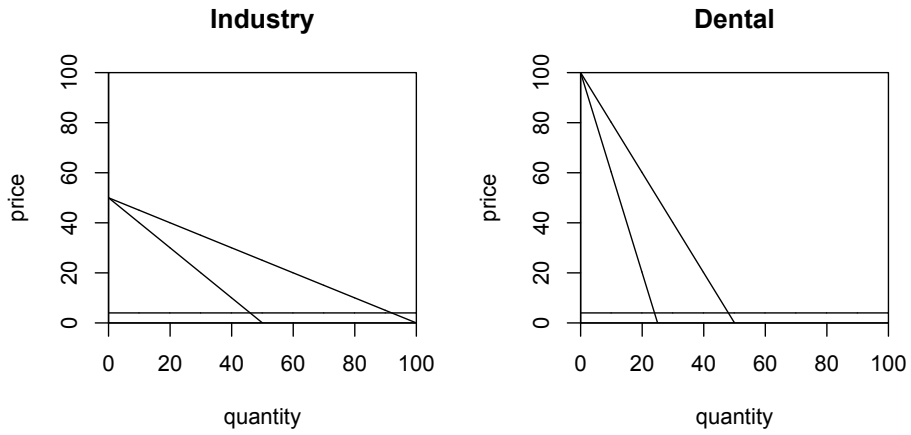

Figure 1: Graphs.

b.) No price discrimination

Now, the two markets become one. We must horizontally sum these demand curves.
$Q_{dental} = 50 - .5P$
$Q_{industry} = 100 - 2P$
$Q_{total} = 150 - 2.5P \iff P = 60 - .4Q$ (for prices below 25)
Profit-maximization,

$$MR = 60 - .8Q = 4 = MC$$

$$56 = .8Q$$

$$Q = 70 \Rightarrow P = 60 - .4(70) = 60 - 28 = \$32$$

$$TR = 2100 + 140 = \$2240$$

$$VC = 4 \times 70 = \$280$$

$$PS = 2240 - 280 = \$1960$$

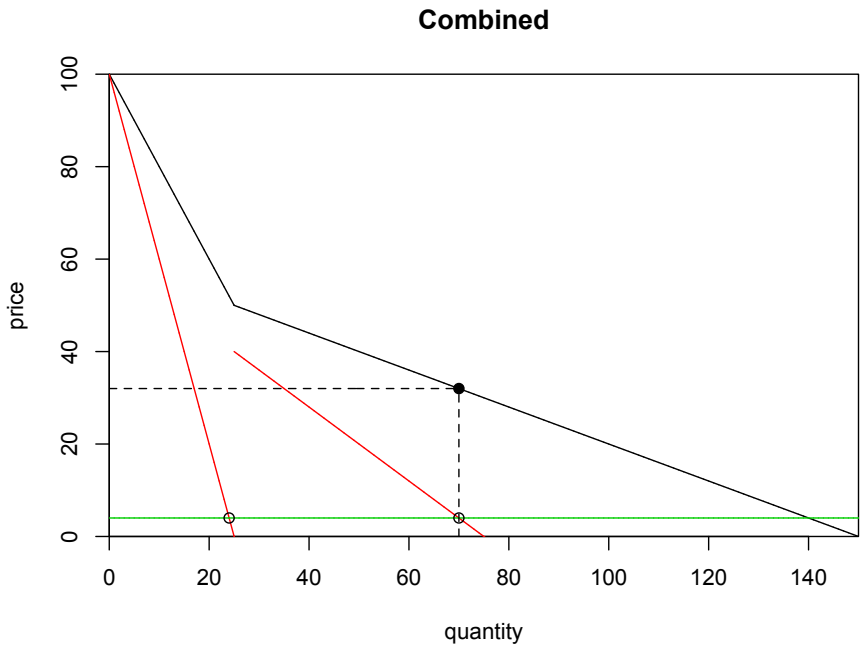

Figure 2: Here there are two intersections of MC/MR. You should technically compare profit at both intersections of MR and MC. It's good enough to note that PS from the high-quantity intersection is higher than the PS from only serving the dental market (the low-quantity intersection calculated in part a). Green is MC, red is MR, black is demand.

c.) We now calculate consumer surplus.

Surplus to the dental segment,
$CS_{den} = \frac{1}{2} \times (100 - 32) \times 34 = 34 \times 34 = \$1156$
Surplus to the industrual segment,
$CS_{ind} = \frac{1}{2} \times (50 - 32) \times 36 = 9 \times 36 = 270 + 54 = \$324$

We see that *total* consumer surplus is higher.

True story.)

By poisoning industrial plastics, the company could prevent resale. This would help maintain the market segmentation. Otherwise, an "industrial" user could buy up plastic molding at a low price and undercut the monopolist's price to dental users.

Question 3

a.) Neither player has a dominant strategy, as their best action depends on the other player's action.
b.) There are two equilibria. In one, both go to the horse show. In the other, both go to the truck rally.