Homework #5 Answers

Chapter 15, question for discussion 4. Under regulation, the prices were set so high that serving customers was very profitable. Planes were flying with plenty of empty seats, but airlines were not allowed to attract customers by cutting the airfares. As a result, firms competed for customers by offering them a better package of services. For example, suppose a high quality meal can be provided at a marginal cost of \$20, but travelers would be willing to pay only \$10. Under regulation, consumers would choose the airline providing the meal, since the airfare is the same. Airlines were happy to provide these expensive services, if it meant attracting the traveler and receiving the high ticket price. If airlines can compete on price, the airline providing the meal must charge \$20 more than the airline not providing the meal, so the consumer would choose the airline not providing the meal. Under competition, these expensive services would not be provided.

Chapter 15, problems 13-16.

$$\begin{aligned} x_1 &= 32 - \frac{p_x^1}{2} \\ x_2 &= 42 - p_x^2 \end{aligned}$$

13. Under price discrimination, the monopolist can optimize on both markets separately. We have inverse demand and total revenue functions

$$\begin{aligned} p_x^1 &= 64 - 2x_1 \text{ and } (64 - 2x_1)x_1 \\ p_x^2 &= 42 - x_2 \text{ and } (42 - x_2)x_2 \end{aligned}$$

Setting marginal revenue equal to marginal cost in market 1, we have

$$64 - 4x_1 = 4,$$

so $x_1 = 15$ and $p_x^1 = 34$. Setting marginal revenue equal to marginal cost in market 2, we have

$$42 - 2x_2 = 4,$$

so $x_2 = 19$ and $p_x^2 = 23$.

14. Under price discrimination, profits are

$$\pi = 15(34) + 19(23) - (15 + 19)4 = 811.$$

15. If it cannot use price discrimination, we must first find the aggregate demand curve over the two markets, by finding total demand as a function of the single price chosen for both markets. Assuming that demand is nonnegative in both markets (which we can verify later), we have

$$X = x_1 + x_2 = (32 - \frac{p_x}{2}) + (42 - p_x) = 74 - \frac{3p_x}{2}.$$

Now compute the market inverse demand curve,

$$p_x = \frac{148 - 2X}{3}.$$

Total revenue is then

$$TR = \frac{148X - 2X^2}{3}.$$

Equating marginal revenue and marginal cost, we have

$$MR = \frac{148 - 4X}{3} = 4 = MC.$$

Solving, we have

$$X = (\frac{136}{4}) = 34, \text{ and } p_x = 26.67.$$

16. Without price discrimination, profits are $\pi = 34(26.67) - 34(4) = 770.$ 7. Notice that profits are lower than with price discrimination, because the firm is constrained to set the same price in both markets. The price chosen is between the two prices it would charge with price discrimination.

Chapter 16, problem 1. The industry demand curve is $X = 250 - p_x$, so the inverse demand curve is

$$p_x = 250 - X = 250 - x_1 - x_2.$$

Firm 1's profit function is therefore

$$\pi_1 = (250 - x_1 - x_2)x_1 - 4x_1$$

Setting the derivative with respect to $x_1$equal to zero and solving for x_1, we get firm 1's reaction function:

$$\begin{aligned} 250 - 2x_1 - x_2 - 4 &= 0, \text{ so we have} \\ x_1 &= \frac{246 - x_2}{2}. \qquad (1) \end{aligned}$$

Firm 2's profit function is

$$\pi_2 = (250 - x_1 - x_2)x_2 - 4x_2$$

Setting the derivative with respect to x_2 equal to zero and solving for x_2, we get firm 2's reaction function:

$$\begin{aligned} 250 - 2x_2 - x_1 - 4 &= 0, \text{ so we have} \\ x_2 &= \frac{246 - x_1}{2}. \qquad (2) \end{aligned}$$

Chapter 16, problem 2. Solving the two reaction functions (1) and (2) simultaneously, we get $x_1 = x_2 = 82$. The price is given by $p_x = 250 - X = 250 - 164 = 86$.

Chapter 16, problem 3. Under Bertrand duopoly (price competition), both firms charge a price equal to marginal cost. Therefore both firms set a price of 4, $p_x^1 = p_x^2 = 4$, so the quantity demanded is 246. The two firms split the market, each producing output of 123.