

Quiz #3

Problem 1 Suppose the market demand function is

$$p = 1 - \frac{1}{1000}(q_1 + q_2) \quad (1)$$

and there are 2 firms, each with a constant marginal cost of \$.28/unit.

a. What price is charged in a Cournot oligopoly equilibrium? Explain.

The equilibrium price is \$.52

b. Fact: the price you solved for in part a. is lower than the price the two firms would charge were they to merge and form a monopoly. Explain why this is intuitively using a couple of sentences.

When a duopolist produces more, the price decreases for both him and his competitor; however, he cares only about the effect of the price decrease on his own firm. When the two firms collude to act as a monopolist, all of the effect of a price decrease is borne by the monopolist, and so there is less incentive to increase quantity, as a decreasing price is relatively more costly.

Problem 2 Suppose Toyota and Honda each choose quantity, but Toyota moves first (Toyota is a Stackelberg leader). The demand curve both face is

$$p = 1 - q_T - q_H$$

a. Solve for the equilibrium price, and the quantity produced by Toyota and by Honda. Give each firm's profit.

Toyota produces $q_T = \frac{1}{2}$ and Honda produces quantity $q_H = \frac{1}{4}$, the equilibrium price is $\frac{1}{4}$. Toyota earns profit of $\frac{1}{8}$, Honda $\frac{1}{16}$.

b. Is it possible for Toyota and Honda to collude to increase both of their profits? If so, give a quantity for Toyota, a quantity for Honda, and demonstrate that each will earn a higher profit than in part a.

Yes. The monopoly quantity is $\frac{1}{2}$. Suppose Honda produces $q_H = \frac{1}{8}$, and Toyota produces $q_T = \frac{3}{8}$. Honda's profits would be $\frac{1}{16}$, Toyota's, $\frac{3}{16}$.

Problem 3 Answer the following questions about oligopoly:

a. Discuss in a couple of sentences why it may be difficult for oligopolists to successfully collude, even when it is profitable to do so. Aside from the fact it is illegal, each oligopolist engaged in collusion has an incentive to cheat, by producing a little more than the prescribed quantity or charging a little less than the prescribed price. Collusion can only be maintained if there is some punishment available for firms detected cheating.

b. In a two-firm oligopoly, is the outcome likely to be more efficient if the firms compete by each choosing quantity or if the firms compete by each simultaneously choosing price? Explain.

Yes, in Bertrand competition, $p = mc$ even with only two firms, while with quantity competition, $p > mc$ for any finite number of firms.

c. **(10 points extra credit)** Suppose there are three firms in a Cournot oligopoly. Market demand is $p = 1 - q_1 - q_2 - q_3$, and each firm has marginal cost of 0. Go as far as you can in solving for the equilibrium outcome.

In equilibrium, $q_1 = q_2 = q_3 = \frac{1}{4}$ and the price is $p = \frac{1}{4}$.

Problem 4 Suppose that BMW can produce and quantity of cars at a constant marginal cost of \$20,000 and a fixed cost of \$10 billion. You are asked to advise the CEO as to what prices and quantities BMW should set for sales in Europe and the United States. The demand for BMW's in each market is given by

$$Q_E = 4,000,000 - 100p_E$$

$$Q_{US} = 1,000,000 - 20p_{US}$$

where all prices are in dollars. Assume that BMW can restrict U.S. sales to authorized BMW dealerships only, so that resale is impossible.

a. What quantity of BMW's should the firm sell in each market, and what should the price be in each market? What will be BMW's total profit? (hint: it will help to solve the demand curves for p_E and p_{US} before doing anything else)

The profit-maximizing price in Europe is \$30,000, and is \$35,000 in the US. One million cars are sold in Europe, 300,000 in the US. Total profit is thus \$4.5B (don't forget to subtract off the \$10B in fixed costs when computing this).

b. If BMW were forced to charge the same price in each market, what would be the quantity sold in each market, the equilibrium price, and the company's profit? (hint: add the two demand curves to get that total demand is given by $Q = 5,000,000 - 120p$, then solve this total demand curve for p)

If BMW must charge the same price in both markets, total demand is given by $Q = 5,000,000 - 120p$. Profit-maximizing price is then given by $p = \$30,833.33$, at which 1,300,000 cars are sold. Total profits are \$4.08B.