Assignment #5 for Managerial Economics, Fall 2015
Due: Monday November 30

Readings: Three Baye chapters. Managing in Competitive, Monopolistic, and Monopolistically Competitive Markets. Basic Oligopoly Models. Game Theory: Inside Oligopoly.

A. Questions from intermediate microeconomics.
  1. A firm sells its product in a perfectly competitive market where other firms charge a price of $80 per unit. The firms total costs are $C(Q) = 40 + 8Q + 2Q^2$.
     a. How much output should the firm produce in the short run?
     b. What price should the firm charge in the short run?
     c. What are the firms short-run profits?
     d. What adjustments should be anticipated in the long run?
  2. You are the manager of a firm that produces a product according to the cost function $C(q_i) = 100 + 50q_i - 4q_i^2 + q_i^3$. Determine the short-run supply function if:
     a. You operate a perfectly competitive business.
     b. You operate a monopoly.
     c. You operate a monopolistically competitive business.
  3. The CEO of a major automaker overheard one of its division managers make the following statement regarding the firms production plans: "In order to maximize profits, it is essential that we operate at the minimum point of our average total cost curve." If you were the CEO of the automaker, would you praise or chastise the manager? Explain.
  4. The second largest public utility in the nation is the sole provider of electricity in 32 counties of southern Florida. To meet the monthly demand for electricity in these counties, which is given by the inverse demand function $P = 1,000 - 5Q$, the utility company has set up two electric generating facilities: Q_1 kilowatts are produced at facility 1, and Q_2 kilowatts are produced at facility 2 (so $Q = Q_1 + Q_2$). The costs of producing electricity at each facility are given by $C_1(Q_1) = 10,050 + 5Q_1^2$ and $C_2(Q_2) = 5,000 + 2Q_2^2$, respectively. Determine the cost function for the utility, $C(Q) = \min_{Q_1,Q_2} C_1(Q_1) + C_2(Q_2)$ subject to $Q = Q_1 + Q_2$. With this, determine the profit-maximizing amounts of electricity to produce at the two facilities, the optimal price, and the utility companys profits.
B. Oligopoly questions.
  1. The inverse market demand in a homogeneous-product Cournot duopoly is $P = 100 - 2(Q_1 + Q_2)$ and costs are $C_1(Q_1) = 12Q_1$ and $C_2(Q_2) = 20Q_2$.
     a. Determine the reaction function for each firm.
     b. Calculate each firms equilibrium output.
     c. Calculate the equilibrium market price.
     d. Calculate the profit each firm earns in equilibrium.
     e. Calculate the quantity and profit that maximize the sum of consumer and producer surplus. Use this to calculate the social inefficiency due to the oligopolistic structure of the industry.
  2. The inverse demand for a homogeneous-product Stackelberg duopoly is $P = 20,000 - 5Q$. The cost structures for the leader and the follower, respectively, are $C_L(Q_L) = 3,000Q_L$ and $C_F(Q_F) = 4,000Q_F$.

   a. What is the followers reaction function?

   b. Determine the equilibrium output level for both the leader and the follower.

   c. Determine the equilibrium market price and the profits of the leader and the follower.

   d. Calculate the quantity and profit that maximize the sum of consumer and producer surplus. Use this to calculate the social inefficiency due to the oligopolistic structure of the industry.

3. Two firms compete in a market to sell a homogeneous product with inverse demand function $P = 400 - 2Q$. Each firm produces at a constant marginal cost of \$50 and has no fixed costs. Use this information to compare the output levels and profits in settings characterized by Cournot, Stackelberg, Bertrand, and collusive behavior.

4. You are the manager of BlackSpot Computers, which competes directly with Condensed Computers to sell high-powered computers to businesses. From the two businesses perspectives, the two products are indistinguishable. The large investment required to build production facilities prohibits other firms from entering this market, and existing firms operate under the assumption that the rival will hold output constant. The inverse market demand for computers is $P = 5,100 - 0.5Q$ and both firms produce at a marginal cost of \$750 per computer. Currently, BlackSpot earns revenues of \$6.38 million and profits (net of investment, R&D, and other fixed costs) of \$1 million. The engineering department at BlackSpot has been steadily working on developing an assembly method that would dramatically reduce the marginal cost of producing these high-powered computers and has found a process that allows it to manufacture each computer at a marginal cost of \$500. How will this technological advance impact your production and pricing plans? How will it impact BlackSpots bottom line?

5. The market for a standard-sized cardboard container consists of two firms: CompositeBox and Fiberboard. As the manager of CompositeBox, you enjoy a patented technology that permits your company to produce boxes faster and at a lower cost than Fiberboard. You use this advantage to be the first to choose its profit-maximizing output level in the market. The inverse demand function for boxes is $P = 800 - 4Q$, CompositeBoxs costs are $C_C(Q_C) = 40QC$, and Fiberboards costs are $C_F(Q_F) = 80Q_F$. Ignoring antitrust considerations, would it be profitable for your firm to merge with Fiberboard? If not, explain why not; if so, put together an offer that would permit you to profitably complete the merger.

6. During the 1980s, most of the worlds supply of lysine was produced by a Japanese company named Ajinomoto. Lysine is an essential amino acid that is an important livestock feed component. At this time, the United States imported most of the worlds supply of lysine — more than 30,000 tons — to use in livestock feed at a price of \$1.65 per pound. The worldwide market for lysine, however, fundamentally changed in 1991 when U.S.-based Archer Daniels Midland (ADM) began producing lysine — a move that doubled worldwide production capacity. Experts conjectured that Ajinomoto and ADM had similar cost structures and that the marginal cost of producing and distributing lysine was approximately \$0.70 per pound. Despite ADMs entry

into the lysine market, suppose demand remained constant at $Q = 208 - 80P$ (in millions of pounds). Shortly after ADM began producing lysine, the worldwide price dropped to $0.70. By 1993, however, the price of lysine shot back up to $1.65. Use the theories discussed in the Baye chapter on Basic Oligopoly Models to provide a potential explanation for what happened in the lysine market.[1] Support your answer with appropriate calculations.

C. Games.

1. While there is a degree of differentiation among general merchandise retailers like Target and Kmart, weekly newspaper circulars announcing sales provide evidence that these firms engage in price competition. This suggests that Target and Kmart simultaneously choose to announce one of two prices for a given product: a regular price or a sale price. Suppose that when one firm announces the sale price and the other announces the regular price for a particular product, the firm announcing the sale price attracts 50 million extra customers to earn a profit of $5 billion, compared to the $3 billion earned by the firm announcing the regular price. When both firms announce the sale price, the two firms split the market equally (each getting an extra 25 million customers) to earn profits of $1 billion each. When both firms announce the regular price, each company attracts only its 50 million loyal customers and the firms each earn $3 billion in profits.

   a. If you were in charge of pricing at one of these firms, would you have a clear-cut pricing strategy? If so, explain why. If not, explain why not.

   b. Solve for the three equilibria for the one-shot game the describes a "one-off" pricing decision.

   c. Propose a mechanism that might solve your dilemma. (Hint: Unlike Wal-mart, neither of these two firms guarantees "Everyday low prices.")

2. Two firms, a supplier and a manufacturer can invest in expensive, complementary technologies, and if they both do this, they will achieve the high quality output that will guarantee both high profits. The problem is that if one of them has invested, the other firm would be better "free riding" on their investment, it's an expensive investment for both of them, and the improvements on just one side will improve profits somewhat, at no cost to the non-investor. Putting numbers on the payoffs, let us suppose they are

	Don't invest	Invest
Don't invest	$(5, 7)$	$(32, 0)$
Invest	$(0, 22)$	$(28, 19)$

   a. Suppose that a vertical merger or acquisition is arranged and that the joint firm receives the sum of the payoffs to the two firms. What is the optimal investment pattern for the joint firm?

   b. Suppose that one of the firms hasn't had the advantage of your experience with the idea of solving dynamic interactions by "looking forward and solving backwards." Not knowing this cardinal principle, they decide that they will move first, invest, and give the other firm every incentive to invest. What will be the result?

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[1]For fun, find business press coverage of the scandal. While under-prosecuted, white collar crime is not completely un-prosecuted.

c. Consider contracts of the form: "I will invest, and if I do not invest while you have invested, I owe you damages of x. You will invest, and if you do not invest while I have invested, you owe me damages of x. Further, this contract is not valid unless both of us have signed it." For what values of x will the contract have the property that signing the contract and then investing becomes the dominant strategy?