Problem set 4
due Thursday, March 31st

Problem 1 A firm maximizes profit by producing a quantity such that marginal revenue equals to marginal cost.

a.   Explain why marginal revenue falls as output rises, for a monopolist.

b.   Marginal revenue is constant as output rises for a firm in a perfectly competitive market. Explain in words the economic intuition for this difference between the properties of the marginal revenue function for the competitive case and the monopoly case.

Problem 2 Chloe operates a donut shop. She estimates the price elasticity of demand for her product is $\epsilon = -1.4$. She is considering **increasing** her price by 10%. It costs Chloe $c(Q)$ to make Q donuts in a given day.

a.   Will Chloe's revenue increase or decrease (or is it uncertain)? Explain why.

b.   Will Chloe's profit increase or decrease (or is it uncertain)? Explain why.

Problem 3 John runs the only carwash in town; he is a monopolist. John estimates his daily demand for carwashes is given by the expression $Q = 100 - 4P$, where Q is the number of carwashes drivers will purchase at price P. It costs John \$5 in electricity, soap, etc to run the carwash once. Additionally, John has fixed costs of \$300/day.

a.   What price should John set for a carwash? What will be his daily profit at this price?

b.   If John were to lower his price by \$1, he would sell more carwashes, and still be able to charge a price above his marginal cost. Explain intuitively why it would not be profit-maximizing to do so.

c.   What is John's elasticity of demand at his profit-maximizing price? Is it elastic or inelastic? If it is elastic, why does he not lower his price, as this would surely bring in many more customers? If inelastic, why does he not raise his price?

Problem 4 Three Chimneys Farms in Midway KY has a monopoly on breeding rights to 2008 Kentucky Derby winner Big Brown. Given what you have learned in Eco 401 about monopoly pricing and animal husbandry, the farm asks your opinion on how Big Brown's stud fees should be set. The farm tells you they have no idea what the demand curve for Big Brown's services is, but they have noticed that every time they move the price by 10%, the number of fillies visiting Big Brown changes by about 15% (in the opposite direction of the price change). Furthermore, the farm estimates that its marginal cost of a visit by a filly is about \$50,000 in additional insurance, mood lighting, etc.

a.   What stud fee do you recommend Three Chimneys charge, and why?

b.   The owners of Pyro, who finished 8th in the same 2008 Derby, come to you with a similar question. Pyro costs less to insure, so the marginal cost of a breeding attempt with Pyro is only \$12,000. Also, Pyro's owners note that every time they change Pyro's stud fees by 10%, demand changes by 75%. What stud fee should Pyro's owners set?

c. Given a plausible explanation about why Big Brown's deamnd is not as responsive to changes in price as is Pyro's.

Problem 5 The Phoenix Moons, a pro football team, have a stadium which seats 30,000 people. All seats are identical. The optimal ticket price is $30, yet this results in an average attendance of only 20,000 people.

a. Explain how it can be profitable to leave 10,000 seats empty.

b. Next week the Moons play the Tucson Turkeys, who have offered to buy an unlimited number of tickets at $4 each, to be resold only in Tucson. How many tickets should be sold to Tucson to maximize profits — 10,000? More than 10,000? Fewer than 10,000?

c. Given your answer to b., what price should the Moons charge their own fans? $4? $5? More than $5?

Problem 6 Rawlings has a monopoly in selling baseballs to major league teams. The demand curve for baseballs is $P = 10 - .1Q$, and the total cost curve is $C(Q) = 2Q + .1Q^2$, so that marginal cost is $MC = 2 + .2Q$.

a. Find the profit-maximizing price and quantity.

b. Commissioner Selig decides to regulate the price of baseballs, arguing that the price is excessive and that there should be more baseballs available. A price ceiling is therefore introduced. Will the price and quantity move in the direction intended by the commissioner?

Problem 7 A drug company has a monopoly on a new patented medicine. The product can be made in ether of two plants (or at both). The costs of production for the two plants are $MC_1 = 20 + 2q_1$ and $MC_2 = 10 + 5q_2$. The firm estimates demand for the medicine is $p = 20 - 3q$.

How much should the firm produce in each plant? At what price should it sell its product?