14.01, 2007 Fall
Problem Set 8
Due: November 16th

1. Please write your name, the name of your TA, and your section/recitation time (e.g. MWF 10am, or F 1 pm) on top of your solutions.

2. Problem sets are due IN SECTION/RECITATION. Late Problem sets will not be accepted under any circumstances.

Questions:

1. Are the following statements true, false? Please give an explanation.

   (a) (7 points) A monopolist producing at a price and quantity where the elasticity of demand is -0.5 is not maximizing profits.

   (b) (7 points) Since monopolies raise prices above the efficient level, the government should always break up the monopolistic firms or foster entry into the market.

   (c) (7 points) Unlike in a perfectly competitive market, imposing a price ceiling on a monopolist may increase output.

2. A monopoly faces market demand $Q = 30 - P$ and has a cost function $C(q) = \frac{1}{2}q^2$.

   (a) (7 points) Find the profit maximizing price and quantity and the resulting profit to the monopoly.

   (b) (7 points) Find the price elasticity of the demand E_{dp} at the price and quantity found in (a). Show that the Lerner Index is equal to $-1/E_{dp}$.

   (c) (8 points) What is the socially optimal price? Calculate the deadweight loss (DWL) due to the monopolist behavior of this firm. Calculate consumer surplus (CS) and producer surplus (PS). Show CS, PS and DWL on the diagram.

   (d) (7 points) Assume that the government puts a price ceiling on the monopolist at $P = 18$. How much output will the monopolist produce? What will be the profit of the monopolist? Calculate CS, PS and DWL. Why is the deadweight loss different now?

(e) (7 points) Assume that the government put a price ceiling on the monopolist in order to maximize the total (i.e. consumer plus producer) surplus. What price ceiling should it choose? How much output will the monopolist produce at this price ceiling? What will the profit of the monopolist be? What is the DWL?

(f) (8 points) Suppose the government charges the monopolist a $130 fee for the right to operate. The monopolist doesn't pay the fee if it decides not to produce. Find the profit maximizing price and quantity and the resulting profits to the monopolist.
Now assume that in addition to the $130 fee, the government puts on the monopolist the same price ceiling as in part (e). Will the monopolist choose to produce in this case?

(g) (8 points) Suppose the government decides to impose a tax of $3 per unit on the monopolist. Find the resulting output, price, government revenue and monopolist's profit. Show on a diagram the consumer surplus, the producer surplus, government revenue and deadweight loss.

(h) (7 points) Assume the monopolist acquired a second factory with a cost function $C_2(q) = 6q$, but it still could use the first factory with the cost function $C_1(q) = \frac{1}{2}q^2$. Find the new profit maximizing price and calculate the amount of output produced in each of the two factories.

3. Suppose that North Pole Enterprises makes ice sculptors in the North Pole and ships them to the United States, where they are sold in the perfectly-competitive icesculpture market for a fixed price of 100 dollars. The primary input in North Pole Enterprises production is ice. Unfortunately, NPE doesn't own any rich ice-producing land in the North Pole, and hence must purchase ice from one of the many firms that produce ice. The market for ice is perfectly competitive, with a supply curve given by

$$S(r) = r,$$

where r is the price of ice. Since NPE is the only demander of ice produced in the North Pole, it acts as a monopsonist. Its production function for sculptures is given by

$$F(x) = 2\sqrt{x},$$

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where x is the amount of ice it uses.

(a) (7 points) How much ice does NPE use?

(b) (2 points) What is the price of ice?

(c) (7 points) Now suppose that the owner of one of the ice companies decides to move to sunny Florida, and so puts her ice company up for sale. Assume that NPE purchases the ice company (NPE is able to operate the firm exactly as efficiently as the original owner). The cost function of the ice-producing firm is

$$c(x) = \frac{1}{2}x^2$$

(this is how much it costs to produce x units of ice) then how much ice will the monopsonist use?

(d) (4 points) Maintain the assumption that NPE has purchased the ice-producing firm. Is there a governmental policy that would improve total welfare in the ice-producing market of the North Pole? If so, briefly describe what its goal would be. If not, briefly explain why not.