Economics 58
Fall 2009

Problem Set # 10

Due 11/20/09

1. Text Problem 14.6

2. Text Problem 14.10

3. **Monopolist as a Price Setter**

Many of the results from the standard theory of monopoly can be more easily derived by treating the monopoly as a price-setter. This problem illustrates how to develop such a model.

a. Suppose the monopoly faces a demand function of the form $q = D(p)$ where $D' < 0,$ but the sign of D'' may be either positive (convex demand) or negative (concave demand). In this case, the monopolist's profits can be written as $\pi(p) = pD(p) - C[D(p)]$. What is the first order condition for a profit maximum in this case?

b. Manipulate your result from part a to show it is equivalent to the usual MR = MC rule.

c. The second order conditions for a profit maximum are complex but informative in this formulation of the monopoly problem. What are these second order conditions? Show that they depend on the sign of $D''(p)$. Show that, if demand is concave $(D'' < 0)$, these second order conditions are satisfied. But when demand is convex (the way we usually draw demand curves, $D'' > 0$) the situation is ambiguous.

d. Show that these second order conditions hold for a linear demand function.

e. Show that if demand takes the constant elasticity formulation $D(p) = p^e$ these second order conditions will definitely hold if $e < -1$ (that is, if demand is elastic).

(Problem 4 on next page)

4. Subsidizing a Monopoly (A revision of problem 14.8)

The distortionary effects of a monopoly can be reduced by subsidizing the purchase of its output.

a. Explain in intuitive terms why this might work.

b. Suppose the government instituted a unit subsidy on the monopoly's output of t per unit. Write out the monopolist's profit-maximization problem in this case and solve for the first-order condition for a maximum. (Hint: Use the price-setting model from Problem 3 by setting the price demanders pay to $p - t$)

c. Suppose that the government wishes this product to be priced efficiently in the sense that $p - t = MC$. Show that this requires $t = -D(p - t)/D'(p - t)$. (Hint: to show this you will have to add and subtract a term of $tD'(p - t)$ in the first order condition)

d. Use your results from part c to show that this optimal t can be computed as $t = -\frac{MC}{e}$ where e is the price elasticity of demand evaluated at $p - t$.