Economics 601 GianCarlo Moschini
Microeconomic Analysis I Fall 2008

Problem Set No. 14 (Last one!) Not due (do it at your leisure before the final exam)

1. A monopolist with cost function $C(x) = c\,x$, where $c > 0$, operates in a market with (inverse) market demand curve is $p(x)$. In this market there is a retail tax of t (i.e., when the consumer pays the price p the monopolist receives $p - t$). We know that the imposition of a positive retail tax increases the price paid by consumers; the question asked here concerns by how much.

   (a) Consider the case when the market demand is $p(x) = a - x$, where $a > c$. Determine whether the unit tax $t > 0$ increases the consumer price by more or by less than t.

   (b) Now consider the case when the market demand is $p(x) = x^{-\theta}$, where $0 < \theta < 1$. Determine whether the unit tax $t > 0$ increases the consumer price by more or by less than t.

2. A monopolist sells in two markets. The demand curve for the monopolist's product is $x_1 = a_1 - b_1 p_1$ in market 1 and $x_2 = a_2 - b_2 p_2$ in market 2, where x_1 and x_2 are the quantities sold in each market, and p_1 and p_2 are the prices charged in each market. The monopolist has zero marginal costs. Note that although the monopolist can charge different prices in the two markets, it must sell all units within a market at the same price.

   (a) Under what conditions on the parameters (a_1, b_1, a_2, b_2) will the monopolist optimally choose not to price discriminate? (Assume interior solutions.)

   (b) Now suppose that the market demand functions take the form $x_i(p_i) = A_i p_i^{-\theta_i}$, for $i = 1, 2$, and the monopolist has a constant marginal cost $c > 0$. Under what conditions will the monopolist choose not to price discriminate? (Assume interior solutions.)

3. A monopolist is facing the (inverse) demand function $p(x) = a + \varepsilon - x$, where p is the price paid by consumers, x is amount of output produced by the monopolist, and a and ε are demand parameters. The (constant) unit cost of production is c, where $0 < c < a$.

   (a) Suppose first that $\varepsilon = 0$. Set up and solve the profit maximization problem of the **quantity-setting** monopolist.

   (b) Now suppose that $\varepsilon \in [-a, \infty)$ is a zero-mean random variable with continuous distribution function $F(\varepsilon)$, so that the monopolist is operating under demand uncertainty. The monopolist maximizes her expected utility and has a strictly concave Bernoulli utility function $u(\pi)$, where π is the profit from selling her product.

      (i) Set up the monopolist's **quantity-setting** problem under this demand uncertainty and derive the optimality condition(s).

(ii) Compare the risk-averse solution under demand uncertainty with the profit-maximizing choice under certainty (you must derive your result explicitly). Let x^0 denote the quantity produced under the optimal price-setting behavior of part (a) and let x^* denote the expected quantity produced under the optimal price-setting behavior of part (b)(i). Is x^* greater than or lower than x^0 ?

4. Consider a monopolist in exactly the same environment as that of problem 3, but now assume that the monopolist chooses the price (rather than the quantity) before uncertainty is realized. Accordingly, it is convenient to rewrite the demand function in direct form as $x(p) = a + \varepsilon - p$. Set and solve the problems of the **price-setting** monopolist both with $\varepsilon = 0$ and under uncertainty. Show that the answer to the last question (i.e., is x^* greater than or lower than x^0 ?) is exactly the opposite of what you found in problem 3 for the quantity-setting monopolist.