

ECON 2100: Problem Set 4

Due 11/3/08 in class

1. Technology for producing q gives rise to a cost function $c(q) = aq + bq^2$. The market demand for q is $p = \alpha - \beta q$.
 - (a) If $a > 0$, if $b < 0$, and if there are J firms in the industry what are the short-run equilibrium market price and the output of a representative firm?
 - (b) If $a > 0$ and $b < 0$, what are the long-run equilibrium market price and number of firms? Explain.
 - (c) If $a > 0$ and $b > 0$, what are the long-run equilibrium market price and number of firms? Explain.

2. Consider a monopolist with total cost function $c(q) = cq$, with $c > 0$, facing a demand function $D(p) = \alpha p^{-\epsilon}$, where $\epsilon > 1$.
 - (a) Derive the monopolist's profit-maximizing price, quantity, and price-cost margin $\frac{p^m - c}{p^m}$.
 - (b) Compute the deadweight welfare loss caused by the monopolist (compared to the competitive outcome).
 - (c) Suppose the government could impose a tax or subsidy on each unit sold by the monopolist. What level of tax or subsidy would lead the monopolist to act efficiently?

3. Consider a monopolist facing two consumers, with demand curves given by $D_1(p) = 2 - p$ and $D_2(p) = 3 - p$. Marginal costs are constant at 1, and there are no fixed costs. Compute profits, consumer surplus, and total welfare in each of the following scenarios:
 - (a) The monopolist can engage in perfect (first-degree) price discrimination.
 - (b) The monopolist can engage in second-degree but not third-degree price discrimination, i.e. he can offer distinct packages (q_1, T_1) and (q_2, T_2) , but each consumer will purchase her preferred bundle (if anything).
 - (c) The monopolist can engage in third-degree but not second-degree price discrimination, i.e. he can charge different prices to each consumer, but must offer every unit sold to a given consumer for the same price.
 - (d) The monopolist cannot price discriminate at all.

4. An industry consists of many identical firms each with total cost function $c(q) = q^2 + 1$. When there are J active firms, each firm faces an identical inverse demand $p = 10 - 15q - (J - 1)\bar{q}$ whenever an identical output of \bar{q} is produced by each of the other $(J - 1)$ active firms.
 - (a) With J active firms, and no possibility of entry or exit, what is the short-run equilibrium output q^* of a representative firm when firms act as Cournot competitors in choosing output (i.e. each assumes the output of the others is fixed).
 - (b) How many firms will be active in the long run?