GS/ECON 5010   Assignment 3   F2007

due : Wednesday November 7   before class

Do all 5 questions. Each counts 20%.

1. What is the equation of the supply curve of a firm which has a total cost function with the equation

$$TC(q) = (q-6)^3 + 3q + 216$$

where q is the quantity of output produced by the firm?

2. What is the equation of the long–run supply curve for an industry, if it has one firm of type t, for each value of $t = 1, 2, 3, \cdots, \infty$, and if a firm of type t has a long–run total cost function

$$TC(q) = (q-6)^3 + tq + 216$$

where q is the quantity of output produced by the firm?

3. Suppose that a (single–price) monopoly faced a market demand with inverse demand curve $p(Q)$ (with $p'(Q) < 0$), and could produce under constant returns to scale at a marginal cost of c per unit produced.

However, the marginal cost c depends on the firm's fixed investment F in technology ; $c'(F) < 0$, since more investment in technology leads to lower–cost production techniques.

(i) Derive an expression for the firm's profit–maximizing level of technology investment.

(ii) Would consumers, in aggregate, be able to bribe the monopoly to invest in further technology investment, above the level which maximizes profits? Explain briefly.

4. Find every Cournot–Nash equilibrium in a duopoly, in which the demand function for the homogeneous product has the equation

$$Q = 14 - p$$

and in which both firms have the same total cost function,

$$TC(q) = 12 + 2q \quad q > 0$$
$$= 0 \quad q = 0$$

5. What would be the equilibrium in a duopoly, if the demand and cost functions were those of question #4 above, but in which the firms moved **sequentially** (as in the "Stackelberg duopoly" presented in question 4.9 of the text)? That is, firm 1 moves first, committing to a quantity of output which it will produce. Firm 2 then observes firm 1's quantity, and, after doing so, chooses its own quantity. (Here firm #1 is aware that firm #2 will be choosing its output level last, and will be reacting to firm #1's own choice of quantity.)