

due : Wednesday November 10 before class

Do all 5 questions. Each counts 20%.

1. Suppose that firms in a competitive industry were not identical. Instead, there is one firm of each type. The cost function for a firm of type t is

$$TC(q; t) = tq + q^2$$

where q is the firm's total production, and t is its type. There is one firm of type 1, 1 of type 2, and so on. Firms are free to enter and exit the industry. What is the equation of the long-run supply curve for the industry?

2. What output would a single-price monopoly choose to produce, if it had a cost function $C(q) = cq$, faced an inverse demand function $p = a - bq$ (where a , b and c are positive constants, with $a > c$), but were also subject to a government-imposed price ceiling, that the price it charge not exceed \bar{p} , where $c < \bar{p} < a$?

3. A market contains 1 million identical consumers, each of whom has preferences which can be represented by the utility function

$$U(X, q_1, q_2) = X + 24(q_1 + q_2) - 2[(q_1)^2 + q_1q_2 + (q_2)^2]$$

where X is consumption of a numéraire good, and q_1 and q_2 are consumption of goods produced by firms #1 and #2 respectively.

If each firm has a constant marginal cost c of production, find the Nash equilibria if the firms choose quantities non-cooperatively (à la Cournot), **and** if they choose prices non-cooperatively (à la Bertrand).

4. What would be the equilibrium price, and aggregate quantity produced, in a market with 100 identical firms, each producing a homogeneous output, if the aggregate inverse demand function were

$$p = 13 - \left(\sum_{i=1}^{100} q_i \right)$$

and each firm had total costs of

$$TC = \begin{cases} q_i + 16 & \text{if } q_i > 0 \\ 0 & \text{if } q_i = 0 \end{cases}$$

where q_i is the quantity produced of good i , if firms all chose their output levels simultaneously?

5. Another model of duopoly is that of **von Stackelberg**, in which firms choose output levels **sequentially**. That is, firm 1 chooses its output. Firm 2 observes what output level firm 1 has chosen, and then chooses its own output level. What output levels would the 2 firms choose, if they behaved in this manner, if they both produced an identical product for which the market inverse demand function had the equation

$$p = A - B(q_1 + q_2)$$

if each firm had a total cost function

$$TC = cq_i$$

where q_i is the output level of firm i ?