

3. Two firms (potentially) inhabit an industry. Firm A's production technology is given by $q_A = \min[x, y]$ and firm B's production technology is given by $q_B = x + y$, where x and y are two factors of production. Firm A will be a monopolist under Bertrand competition as long as the prices of the two factors are both positive.

4. The production functions (1) $q = 2x + y$, (2) $q = \min[2x, y]$, and (3) $q = (2x)^{.5}y^{.5}$, where x and y are two factors of production, all exhibit Constant Returns to Scale.

5. Profits of all firms in an industry can be negative in a competitive short-run equilibrium..

6. A firm in a competitive output market is unsure of what the ultimate product price will be at the time she has to make her output decision. She believes that with probability .5 the price will be 2 and that with probability .5 it will be 4. If she acts so as to maximize expected profits she will make the same decision as she would if she knew with certainty that the product price would be 3.

7. Two firms consider entering a new market. The demand for the good is given by $Q = 10 - p$. The total cost of production for firm A is $TC_A(q_A) = 4q_A$, while the cost function for firm B is $TC_B(q_B) = 8q_B$. If the firms interact as Bertrand (price-setting) competitors firm A will be a monopolist and will charge a price of 8.

Part II. Problems.

Answer each part of each of the following problems. Remember to show all of your work.

8. (12 points) 100 individuals live in a market and possess utility functions defined over two goods, x and y . The utility function of each individual is given by $U(x, y) = x + y$. Each individual faces the same prices of the two goods, p_x and p_y , each has an income of $I = 1$, and the price of good y is 1. There exists a large number of “potential” entrants into the industry, and each has a total cost function given by $TC(q_x) = 10q_x - 4q_x^2 + q_x^3$.

(a) Define the market demand function for good x (remember that $p_y = 1$ and each individual has an income of 1).

(b) Determine the number of firms that would produce the good x in a long-run competitive equilibrium (HINT: The correct answer to this question belongs to the set $\{0, 1, 2, \dots\}$).

9. (24 points) Two firms share an industry in which total product demand is given by $Q = 20 - p$. The average cost of production for each firm is 8.

(a) Derive the reaction functions of the two firms (note that the firms are symmetric).

(b) Find the Cournot-Nash equilibrium (in quantities produced by each firm) in this market.

(c) If the firms collude so as to maximize profits in the industry, and each receives an equal share of the profits, what should the output levels of the two firms be?

(d) Discuss any problem(s) that might exist with implementing the collusive arrangement derived in your previous answer.

10. (12 points) A monopsonist occupies a market in which 10 potential workers live. Each one has a labor supply function given by $h(w) = \frac{w}{2}$, where w is the wage rate set by the firm. The firm sells its output in a competitive market, and the price it receives for each unit sold is 10. The firm's production function is $y(H) = H$, where H is the total amount of labor supplied to the firm.

(a) Find the profit-maximizing wage offer.

(b) If the government imposes a minimum wage of 8 will output in this industry increase, decrease, or stay the same? (Provide a rigorous justification for your response)

11. (10 points) Two dry cleaning establishments are located on a residential block which has length 1. Firm A is located at the extreme left end of the block [its “address” would be 0] while firm B is located on the far right end of the block [its address would be 1]. All individuals living on the block purchase exactly one unit of dry cleaning services from one of the two firms, and individual consumers are uniformly distributed along the block. If a consumer who lives a distance x from firm 1 goes to firm 1, she pays $p_1 + x$, where p_1 is the price charged by firm 1. Similarly, if the individual lives a distance y from firm 2, she pays a total price of $p_2 + y$ if she goes there. Given that each firm is a profit-maximizer and that the average cost of production is 0 for both, what are the equilibrium prices charged by the two firms?