

ECON 468: Industrial Organization
Problem Set 1

Due date: February 12th

January 29, 2008

1. The only factory of a small town employs workers for \$5 an hour, for forty-hour weeks. The closest urban center is located at 1 hour driving, and the average comparable wage is \$10 an hour (also for forty-hour weeks). If the commuting cost is \$10 (one-way), what is the opportunity cost of working and living in the small-town factory?
2. A firm can choose between two production technologies for a new product line. If it installs technology 1, its yearly costs will be $C_1(q) = 10 + 2q^2$. If it installs technology 2, its yearly costs will be $C_2(q) = 30 + \frac{q^2}{2}$.
 - (a) What is the firm's long-run average cost curve¹?
 - (b) What is the firm's minimum efficient scale of production (i.e. minimum of the long-run average cost curve)?
 - (c) Which technology would the firm prefer (purely from a cost standpoint) if the expected demand is 10?
 - (d) What is the expected demand which would make the firm indifferent between the two technologies (purely from a cost standpoint)?
3. A firm produces two goods A and B in constant proportions ($1/3$ and $2/3$ respectively). The joint cost of producing these two goods is:

$$C(q_a, q_b) = 1000 + 10q_a + 5q_b + 9q_aq_b$$

- (a) Derive the ray-average cost function.
 - (b) What is the minimum efficient scale (MES) of production?
 - (c) What is the MES if only A is produced?
4. Suppose a firm's costs are
$$C(q) = 100 + 2q^2.$$
 - (a) If all fixed costs are sunk, what is the price under which this firm will shut-down?
 - (b) If only a portion ω of the fixed costs are sunk, what is the shut-down price of this firm?

¹You should use Excel or any other spreadsheet software to produce the graph.

- (c) The industry demand is given by $Q = 1000 - p$. If 99 firms are active in the industry and $\omega = \frac{1}{2}$, what is the short-run competitive equilibrium (i.e. price, quantities, profits)?
5. (Carlton-Perloff, Ch. 3, Question 3) Suppose a competitive market consists of identical firms with a constant long-run marginal cost of 10. (There are no fixed-cost in the long-run.) Suppose the demand curve is given by $Q = 1000 - p$.
- (a) What are the price and quantity consumed in the long-run competitive equilibrium?
- (b) Suppose one new firm enters that is different from the existing firms. The new firm has constant marginal cost of 9 and no fixed cost but can only produce 10 units (or fewer). What are the price and quantity consumed in the long-run competitive equilibrium? Are these the same as before? Explain.
- (c) Are positive economic profits inconsistent with a long-run competitive equilibrium?
- (d) In the long-run competitive equilibrium, must the profit of the marginal entrant be zero?
6. (Carlton-Perloff, Ch. 4, question 3) If the demand curve is

$$Q = \frac{5}{P},$$

what is the elasticity of demand?. What is total revenue when $p = 1$ and when $p = 30$? If production costs \$1 per unit, and the smallest production level is 1 unit, how much should the monopolist produce?

7. A market with demand $Q = \frac{16}{p^2}$ is supplied by a monopoly with costs $C(q) = 6 + \frac{q^2}{8}$. Calculate the equilibrium price, output, and monopoly profits. What would be the equilibrium if the firm was behaving competitively (i.e. price-taker)?