ECO 3139 (Industrial Organization I) **Spring/Summer 2015**

Practice Problem Set #1

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1. A homogeneous good industry is composed of 3 firms. You are given the following information on output, price and marginal cost of each firm:

$q_1 = 200$
$q_2 = 500$
$q_3 = 100$
$p = 50$
$c_1 = 41.7$
$c_2 = 29.2$
$c_3 = 45.8$

Remember that for each firm

$$\frac{p - c_i}{p} = \frac{\alpha_i}{\eta},$$

where α_i is the market share of firm i and η is the price elasticity of demand.

a) Calculate the 2-firm concentration ratio.
b) Calculate the Herfindahl index.
c) Calculate the number equivalent.
d) Calculate the Lerner index of ach firm.
e) Calculate the price elasticity of demand.

2. a) The bicycle industry consists of seven firms. Firms 1, 2, 3, 4 each has 10% market share, and firms 5,6,7 each has 20% market share. Using the concentration measures, answer the following questions:

(i) Calculate 4-firm concentration ratio for this industry.
(ii) Calculate the Herfindahl index (I_{HH}) for this industry.
(iii) Now, suppose that firms 1 and 2 merge, so that the new firm will have a market share of 20%.

1) Calculate the post merger I_{HH}
2) Calculate the change in the I_{HH} caused by the merger.
3) Will this merger be challenged in the U.S.? In Canada?

3. a) Show whether the cost function $C(q_1,q_2) = q_1^{1/4} + q_2^{1/4} - (q_1q_2)^{1/4}$ exhibits both economies of scope and economies of scale.

   b) Derive the conditions under which the cost function $C(q_1,q_2) = 1 + (q_1 + q_2)^2$ exhibits both economies of scale and economies of scope.

4. Consider a market in which all firms have the following total cost function.

$$C(q) = 150 + q + 0.5q^2$$

   a) What level of output corresponds to the minimum average total cost (minimum efficient scale)?
   b) If firms are perfectly competitive, what is the equation of an individual firm's supply function?

   Assume that market demand is given by $Q = 300 - 2p$

   c) In the long run, what will be the equilibrium level of output and prices if the market is perfectly competitive?
   d) In the long run, how many firms will exit in the market? (Assume once again that market is perfectly competitive.)
   e) Compute total industry profit in the long run.

5. Consider a monopoly selling at a single market where the demand is given by $Q(p) = \alpha p^{-\varepsilon}$, $\varepsilon > 1$. Suppose that the cost function of this monopoly is given by $TC(Q) = cQ$, $c>0$.

   a) Calculate the demand elasticity, and, write the marginal revenue function as a function of price.
   b) Using your above calculation, find the price charged by the monopoly as a function of ε.
   c) What happens to the monopoly's price when ε increases? Interpret your result.
   d) What happens to the monopoly's price as $\varepsilon \rightarrow 1$? Explain.
   e) Calculate the total revenue function TR(Q) and the marginal revenue function MR(Q).
   f) What is the monopoly's profit-maximizing output?

6. Consider the production function given by $Q = l^{\alpha} + k^{\alpha}$, $\alpha > 0$, l = labour and k = capital.

    a) For which values of α does this production technology exhibits IRS, CRS, and DRS?

7. Consider the cost function given by $Q = F + cQ$, where $F, c > 0$.

    a) At what output level is the average cost minimized?

    b) Infer whether this technology exhibits IRS, CRS, or DRS. Explain.