EC3322
Industrial Organization I
Semester 2, 2009-2010
Midterm
March 3, 2010

Instructions

1. Do NOT start reading the questions until you are told to do so.
2. There is a total of 4 pages, including this front page. Make sure you have all 4 pages before beginning.
3. This exam consists of 4 sections. Do ALL questions in ALL sections. The exam totals 100 points.
4. Write your answers in the answer booklets provided.
5. Write your matriculation number and your tutorial group number on the answer booklets provided RIGHT NOW. Do not write your name on the answer booklets. If you do not write your matriculation number, tutorial number, or exam number, you will be penalized 5 points.
6. You MAY NOT use calculators.

Section 1 (20 points)

Answer ALL FOUR questions in this section. Each question is worth 5 points. Clearly write the question numbers and your answers in the answer book.

1. (5 points) A perfectly-competitive firm has the long-run cost function $C(q) = 4q^2 + 196$. In the long run, it will supply a positive amount of output so long as price is greater than or equal to:

   (a) \$120
   (b) \$112
   (c) \$56
   (d) \$28
   (e) \$14

2. (5 points) A firm sells one million units at a price of \$100 for each unit. The firm's marginal cost is constant at \$40 and its average cost (at the output level of one million units) is \$90. The firm estimates that its elasticity of demand is constant at -2. The firm should:

   (a) raise the price
   (b) lower the price
   (c) leave the price unchanged
   (d) not produce

3. (5 points) If New York City expects than an increase in bus fares will raise mass transit revenue, it must think that the demand for bus travel is:

   (a) inelastic
   (b) unit elastic
   (c) elastic
   (d) perfectly inelastic
   (e) 10

4. (5 points) If the sellers in the cigarette industry formed a cartel and decided to set price along a straight-line downward-sloping demand curve, which point would they choose if they wanted to gain the highest total revenue?

   (a) The point nearest the vertical axis, where the price is highest
   (b) The point nearest the horizontal axis, where quantity demanded is greatest
   (c) One of the points higher up on the demand curve, where demand is elastic
   (d) One of the points lower down on the demand curve, where demand is inelastic
   (e) The point where demand is unit elastic

Section 2 (20 points)

Answer the the following question. You must include your work in order to receive full marks.

Consider a three-period version of the Stackelberg model. The market inverse demand function is $p = 120 - Q$, and suppose that there are three firms that set their output levels sequentially: firm 1 sets q_1 in period 2, firm 2 sets q_2 in period 2, and firm 3 sets q_3 in period 3. Assume marginal cost is zero. Solve for the equilibrium output level of each firm and the market price in the Stackelberg SPNE.

Section 3 (20 points)

Answer the following question. You must include your work in order to receive full marks.

Firm 1, 2, and 3 produce a homogeneous product and face a market demand curve of $Q = 120 - 4p$, where Q is the total quantity and p is the price. Firm 1 has the cost function $C(q_1) = 10q_1$. Firm 2 has the cost function $C(q_2) = 15q_2$. Firm 3 has the cost function $C(q_3) = 30q_3$. Firms compete in prices in this market.

1. (5 points) Suppose initially that firm 1 is the only firm in the market. What is the equilibrium price, output, and profit?
2. (5 points) Derive the equilibrium price, outputs, and profits. (Ignore any epsilon when computing output and profits so your answers are round numbers. For example, if you think the equilibrium price is 50 - ϵ, then write this as your answer for price but use 50 when computing outputs and profits.)
3. (10 points) Suppose now that there are only two firms in the market, firm 1 and firm 3. Derive the equilibrium price, outputs, and profits. (Again, ignore any epsilon when computing output and profits so your answers are round numbers.)

Section 4 (40 points)

Answer the the following question. You must include your work in order to receive full marks.

Apple's iPod has been the portable MP3 player of choice among many gadget enthusiasts. Suppose that Apple has a constant marginal cost of \$60, and that market demand is given by $Q = 200 - 2P$.

1. (5 points) If Apple is a monopolist, find its optimal price and output. What are its profits?
2. (5 points) Now suppose that there is a competitive fringe of 12 price-taking firms, each of whom has a total cost function $C(q) = 3q^2 + 60q$. Find the supply function of the fringe.

3. (15 points) If Apple operates as the dominant firm facing competition from the fringe in this market, what is its optimal output? How many units will fringe providers sell? What is the market price and how much profit does Apple earn?

4. (10 points) Graph your answer to part (c). Your graphs should include the fringe supply curve, the residual demand curve, the marginal revenue curve of the dominant firm, etc.

5. (5 points) Suppose Apple's marginal cost is instead \$10. Re-answer part (c). Add the new equilibrium to the graph in part (d)