ECON 201, Prof. Hogendorn: Problem Set #9

1. There are 10,000 residents of a town, each of whom has an endowment of 50,000 units of good x, which is a composite good measuring private expenditure. Thus, each consumer has $\omega = \$50,000$. There is also a library which is a public good; the number of books in the library is L. Each resident has a Cobb-Douglas utility function

$$u(x, L) = x^{0.99} L^{0.01}$$

The library can buy books according to a cost function $c(L) = 20L$, i.e. each book costs \$20.

   (a) Write the Samuelson condition optimal provision of the public good, and simplify. (You don't need to derive the condition, just use it.)

   (b) Suppose the town sets a lump-sum tax t on each resident, so consumption of x is $50,000 - t$. Assume the town sets t to satisfy the Samuelson condition and cannot run a deficit or surplus. What is t? What is L?

   (c) Using the formula for voluntary provision of a public good, how many books would be purchased if the library were financed by private contributions?

2. For each of the following industries, which of the models we have studied would best describe the industry? State your assumptions about the cost function and demand curve that justify your choice.

   (a) Fast food.

   (b) Small hardware stores.

   (c) Gasoline.

   (d) First-class mail.

3. Suppose there are 100 consumers, each with demand curve

$$X(p) = 6 - p$$

There is a monopoly which produces this good, and it has constant marginal cost of \$2 per unit.

   (a) What is the monopoly optimal price, quantity, and profit? (Since this is a linear demand curve, the Lerner index form for $MR = MC$ will not be much help here – just start from maximizing profits.)

   (b) Suppose the monopoly charges $p = 2$ and adds a flat fee to create a 2-part tariff. What is the quantity produced, the amount of the fee, and the profit?

(c) Suppose that 50 of the consumers receive a raise and their demand curves each shift to $X(p) = 8 - p$. Assume the monopoly still wants to use a 2-part tariff, but it cannot charge different prices to the different consumers. What will be the per-unit price, the flat fee, the quantity sold, and the profit? (Hint: First calculate the consumer surplus of the low-demand consumer at some price p. Set the flat fee equal to this amount. Then write the total profits as the sum of the flat fees collected plus revenue minus costs from per-unit sales. Maximize this function with respect to p.)

4. Demand for electricity is

$$X(p) = 10000p^{-2}$$

There are 2 generators selling electricity. Each generator has constant marginal costs of \$3. Use the elasticity form of the $MR = MC$ condition to answer the following questions quickly.

   (a) Each generator assumes that the other produces output $\hat{y}$ (Cournot conjectures). What is the Cournot equilibrium price, quantity, and profit?

   (b) If each generator produced one-half the monopoly output, what would be the price, quantity, and profit?

5. Two American companies, Case and John Deere, have decided to introduce their tractors in either the Polish market or the Hungarian market. Neither company has sufficient resources to enter both markets.

   If they both enter the Polish market, they both expect profits of \$1 million. If they both enter the Hugarian market, they both expect profits of \$1.5 million.

   If Case enters the Polish market and John Deere enters the Hugarian market, then Case expects profits of \$3 million and John Deere expects profits of \$4 million.

   If Case enter the Hungarian market and John Deere enters the Polish market, then Case expects profits of \$5 million and John Deere expects profits of \$3 million.

   There is a single consulting firm with special expertise that will enable either Case or John Deere to move first. The firm will offer its services to the highest bidder.

   What is the most likely outcome?

   (a) Case outbids John Deere for the consultant's services. Case enters the Polish market first and then John Deere enters the Hungarian market.

(b) Case outbids John Deere for the consultant's services. Case enters the Hungarian market first and then John Deere enters the Polish market.

(c) John Deere outbids Case for the consultant's services. John Deere enters the Polish market first and then Case enters the Hungarian market.

(d) John Deere outbids Case for the consultant's services. John Deere enters the Hungarian market first and then Case enters the Polish market.