Problem Set #2
Due September 24, 1997

1. In the figure at the right are a supply curve, S, and a demand curve, D, together with several labeled prices, quantities, and areas. Identify the following:


   a) The market equilibrium price for this market alone.

   b) Total producer surplus in that market equilibrium

   Suppose now that this market is not alone, but that buyers and sellers have access to another market (the world market) which is much larger and in which they can both buy and sell at will at price P_3. As a result, price in this market becomes P_3, with buyers and/or sellers using the world market to make up any difference between supply and demand. Identify the following:

   c) The quantities of the good produced and consumed after opening. What is the nature and quantity of the trade between this market and the world?

   d) The revenue of suppliers and the expenditure by demanders.

   e) The changes in producer and consumer surplus caused by opening up to this world market.

   Suppose finally that the price on the world market now rises, from P_3 to P_2. What changes occur, as a result of this price increase, in the following variables?

   f) Quantities supplied, demanded, and traded?

   g) Producer and consumer surplus?
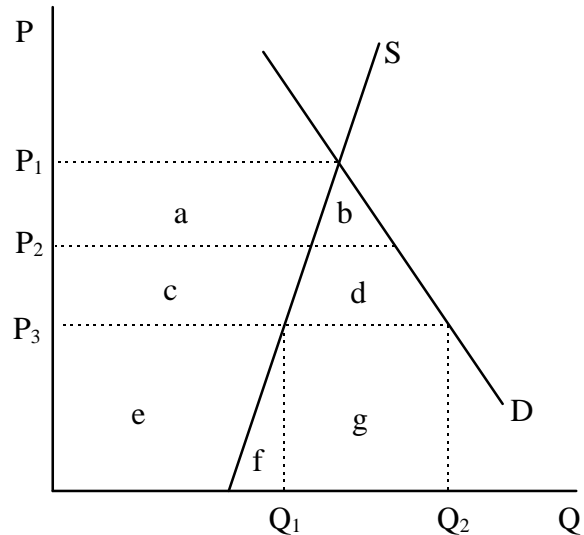
2. The demand for noodles in Hong Kong per day is given by

$$P = 40 - 10Q$$

where Q is the quantity of noodles sold per day, in millions of bowls, and P is the price in HK\$ per bowl. Suppliers of noodles make them available at a constant cost of HK\$20 per bowl. Recognizing the unique health benefits of noodles, the Hong Kong government is considering providing a subsidy to their production of HK\$2 per bowl.

a) Without the subsidy, calculate the market equilibrium quantity and price of noodles in Hong Kong.

b) Hong Kong's GDP is in the neighborhood of US\$100 billion. (Note this is US\$, not HK\$. The exchange rate is about HK\$8=US\$1) Approximately what percentage of Hong Kong's GDP is noodles, if the above information is correct? (Make explicit any additional assumptions that you make.)

c) If the proposed subsidy is provided, what will be the new quantity of noodles produced and consumed, how much will consumers pay per bowl and how much will suppliers receive?

d) Calculate the changes in consumer surplus and producer surplus due to the subsidy. How much will the subsidy cost the government?

e) If consumers are unaware of these health benefits, how much would the benefits have to be worth in order for this subsidy to be a socially desirable policy?

f) How would your answer to part (e) change if the health benefits of noodles *are* correctly perceived by consumers?

3. There are 10 households in Upper Middle Centrebrook, each with an annual demand for electricity of q = 50 - P. Upper Middle Centrebrook Hydro (UMCH), which generates electricity for the city, has a total cost curve of TC = 500 + Q.

a) In the past, UMCH has been required to give away electricity for nothing, satisfying the demands of all ten households. Its costs were covered by a lump-sum grant from the city, financed by equal lump-sum taxes on each of the ten households.

   i) How much electricity was produced and consumed each year?

   ii) How much tax did each household have to pay?

b) An SPP intern at the office of the Upper Middle Centrebrook City Administrator has pointed out that this method of providing electricity is not efficient.

   i) If the regulators of UMCH want to make sure that the market for electricity is efficient, what price will they force UMCH to charge?

       ii) What will output be in that case, if UMCH is also required to satisfy all demand at that price?

       iii) Calculate the change in consumer surplus and the change in UMCH's profit, due to moving from the zero price to the efficient price. Assume that the same lump-sum taxes and the grant to UMCH from part (a) continue.

       iv) What would be the profit of UMCH, charging the efficient price, if the taxes and grant were discontinued?

c) Suppose now that citizens object to paying both a lump-sum tax and a positive price for electricity.

       i) If the regulators want to make sure that UMCH won't lose money in the absence of any grant from the city, what is the lowest price they can impose?

       ii) Calculate output, consumer surplus, and profit in that case. (Hint: the quadratic equation should be useful in this problem).

       iii) How does this solution compare, in terms of total social welfare, to the other two?

4. A community has three households, A, B, and C, each with a different demand curve for police protection, as shown below. As a group, they could purchase police protection for all of them together at a marginal cost of 18. Individually they could purchase it for just themselves at a marginal cost of 9. Assume that the same household demand curves apply for police protection in both of these forms.

a) Graph this community's willingness to pay for community police protection as a public good, carefully labeling intercepts and kinks. What is the socially optimal level of community protection that they should select? If they divide the cost of that optimal protection equally among the households, how much will each pay and how much consumer surplus, if any, will each enjoy?

b) Graph the community's demand for police protection as a private good and determine the total amount that the three households together would buy at the price of 9. How much consumer surplus does each household get when it buys police protection privately. Is each better or worse off than in part (a)?

c) How should police protection be provided to this community – as a public good or as a private good? What problems do you see with this solution?