Economics 500: Microeconomic Theory

State University of New York at Binghamton
Department of Economics
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Problem Set #4

1. Heidi receives utility from two goods, goat's milk (M) and strudel (S), according to the utility function

$$U(M,S) = MS$$

   a. Show that increase in the price of goat's milk will not affect the quantity of strudel Heidi buys – that is, show that $\partial S/\partial P_M = 0$.
   b. Show also that $\partial M/\partial P_S = 0$.

2. A utility function is termed "separable" if it can be written as

$$U(X,Y) = U_1(X) + U_2(Y),$$

   Where $U_i' > 0$, $U_i'' < 0$.

   a. What does separability assume about the cross partial derivative U_{XY}? Give an intuitive discussion of what word this condition means and in what situations it might be plausible.
   b. Show that if utility is separable, neither good can be inferior.
   c. Does the assumption of separability allow you to conclude definitively whether X and Y are gross substitutes or gross complements? Explain.

3. "Gaining extra revenue is easy for any producer – all it has to do is raise the price of it's product." Do you agree? Explain when this would be true, and when it would not be true.

4. Suppose that the market demand curve for pasta is a straight line of the form

$$Q = 300 - 50P$$

   where Q is the quantity of pasta bought in thousands of boxes per week and P is the price per box (in dollars).

   a. At what price does the demand for pasta go to zero? Develop a numerical example to show that the demand for pasta is elastic at this point.
   b. How much pasta is demanded at a price of zero? Develop a numerical example to show that demand is inelastic at this point.
   c. How much pasta is demanded at a price of $3? Develop a numerical example that suggest that total spending on pasta is as large as possible at this price.

5. Marvin currently spends 35 percent of his $100,000 income on renting his apartment. If his income elasticity of demand for housing is 0.8, will this fraction rise or fall when he gets a rise to $120,000? Would you give a different answer to this question if Marvin's income elasticity of demand for housing were 1.3?

6. Tom, Dick and Harry constitute the entire market for scrod. Tom's demand curve is given by

$$Q_1 = 100 - 2P$$

for $P \leq 50$. For $P > 50$, $Q_1 = 0$. Dick's demand curve is given by

$$Q_2 = 160 - 4P$$

for $P \leq 40$. For $P > 40$, $Q_2 = 0$. Harry's demand curve is given by

$$Q_3 = 150 - 5P$$

for $P \leq 30$. For $P > 30$, $Q_3 = 0$. Using this information, answer the following:

   a. How much scrod is demanded by each person at P = 50? At P = 35? At P = 25? At P = 10? At P = 0?
   b. What is the total market demand for scrod at each of the prices specified in part (a)?
   c. Graph each individual's demand curve.
   d. Use the individual demand curves and the results of part (b) to construct the total market demand curve for scrod.

7. Suppose that ham and cheese are pure complements – they will always be used in the ratio of one slice of ham to one slice of cheese to make a sandwich. Suppose also that ham and cheese sandwiches are the only goods that a consumer can buy and that bread is free. Show that if the price of a slice of ham equals the price of a slice of cheese.
   a. The own-price elasticity of demand for ham is -1/2.
   b. The cross-price elasticity of a change in the price of cheese on ham consumption is also -1/2.

8. For a linear demand curve show that the price elasticity of demand at any given point is given by minus the ratio of the price associated with that quantity to the price where quantity equals zero. Explain how this result provides an alternative way of showing how elasticity varies along a linear demand curve. How might you apply this result to a nonlinear demand curve?

9. A "luxury" is defined as a good for which the income elasticity of demand is greater than 1. Show that for a two-good economy, both goods cannot be luxuries. (Hint: What happens if both goods are luxuries and income is increased by 10 percent?)