ECON 201, Prof. Hogendorn: Problem Set #4

1. The residents of Uurp consume only pork chops (X) and Coca-Cola (Y). The utility function of the typical resident of Uurp is given by

$$U(X,Y) = \sqrt{XY}$$

In 2000, the price of pork chops in Uurp was $1 each; Cokes were also $1 each. The typical resident consumed 40 pork chops and 40 Cokes (saving is impossible in Uurp). In 2001, swine fever hit Uurp, and pork chop prices rose to $4; the Coke price remained unchanged. At these new prices, the typical Uurp resident consumed 20 pork chops and 80 Cokes.

   (a) What was the change in utility from 2000 to 2001?

   (b) What was the Laspeyres price index for 2001?

   (c) What was the Paasche price index for 2001?

   (d) What do you conclude about the ability of price indices to measure changes in welfare?

2. Mr. Lee is an eccentric millionaire who made his money by manipulating the price of rice in Singapore. He now lives in Middletown, CT, where he purchased a defunct Bradlees department store and converted it to a house. In front of the house is a very large parking lot. Mr. Lee likes to consume large numbers of cars to fill up this parking lot (they can only be the latest model year, so he needs to buy a lot of new cars every year).

   Last year the price of Hyundais was $8,000 and the price of Mercedes was $45,000. Mr. Lee bought 200 Hyundais and 25 Mercedes. These have now been towed away, and it is time to buy this year's cars. Unfortunately, the price of Hyundais has risen to $13,000 this year.

   The slope of Mr. Lee's Slutsky compensated demand function for Hyundais is -0.001 (i.e. one less Hyundai for each $1,000 increase in price). The slope of his Engel curve for Hyundais is –0.00001 (i.e. one less Hyundai for each $100,000 increase in income).

   (a) Using the Slutsky equation, what is the slope of Mr. Lee's Marshallian demand for Hyundais? How many does he buy this year (assuming the linear estimate of slope can be used)?

   (b) Assuming Mr. Lee's income did not change and he spends it all on Hyundais and Mercedes, how many Mercedes does he buy this year?

   (c) Graph Mr. Lee's consumption decisions in the two years using budget lines and indifference curves.

   (d) Which ones of the following describe Hyundais: substitute for Mercedes, complement to Mercedes, normal good, inferior good, Giffen good.

3. Aisha runs a one-person, ten-cow dairy operation which produces 600 gallons of milk a week. This is her sole source of income. Aisha's utility function is

$$U(X, M) = 60X^2 M^4$$

where M = gallons of milk and X = numeraire.

(a) What is Aisha's demand function for milk?

(b) Show whether milk is a normal or an inferior good.

(c) The price of milk is $4 per gallon. How many gallons of milk does Aisha consume? How many dollar units of other goods?

(d) All the dairies except Aisha's are hit by a tornado, wiping out many cows and causing the price of milk to rise to $10 per gallon. Break down the corresponding change in Aisha's consumption of milk between the substitution, ordinary income, and endowment income effects.

(e) The government gives all the dairy farmers a milk-producing hormone to feed to their cows. Aishas cows become twice as productive, producing 1200 gallons of milk a week. However, all this extra milk on the market causes the price to drop to $3 per gallon. Will Aisha change her consumption of milk, and if so, by how much?

4. John was the owner of a local pharmacy in Portland, CT, but he decided to sell out to Brooks, a big corporation. He invested his money from this sale and receives $204 a week in interest income from this and other investments. He decides to work for Brooks, which offers him an hourly wage of $16. His utility function is

$$U(C, R) = (C + 500)R$$

where C = consumption of goods and services (which cost $1 per unit), and R = hours of leisure.

(a) Graph John's budget constraint and mark John's endowment point on the constraint.

(b) How many hours will John work per week? Mark John's consumption point on your graph from (a) and show how to read off the number of hours worked from the graph.

(c) Brooks is forced by government regulation to pay an overtime wage: For every hour over 40 worked per week, the company pays 1.5 times the usual hourly wage, namely $24. Graph John's new budget constraint on the same graph as you used for sections (a) and (b). Explain why John will now increase his number of work hours.

(d) Brooks finds a loophole in the government regulation and stops paying overtime. To get even, the government places a wage tax of 50% on Brooks, which it passes along fully to its workers. Graph John's new budget constraint on the same graph as you used for sections (a), (b), and (c). Now how many hours will John work per week?

(e) Does this change in hours worked imply that leisure is an inferior good? Explain why or why not.