EC 501: Problem Set 4
(Due in class on Tuesday, October 1)

1. A household has utility function $U(F,C) = F^{1/2} C^{1/2}$, where F is food and C is a composite of all other goods. Prices of F and C are both \$1 and the household's income is \$100.

    (a) How much F and C will the household buy? (You do not need to derive the demand functions.)
    (b) Now suppose government wants to try to triple the household's income by giving it an in-kind subsidy of 200 units of food, which cannot be re-sold. Draw a diagram showing the household's budget constraint now, in relation to its budget constraint and choice from part (a). How much F and C will the household buy now?
    (c) Show graphically and then calculate a dollar measure of how much better off the household is as a result of this subsidy. State clearly what measure you have used.

2. When the price of gasoline is \$1 per gallon, you consume 1,000 gallons per year. Then two things happen: (1) The price rises to \$2 per gallon, and (2) Your income rises by \$1,000 per year. All other prices being the same, are you better off, just as well off, or worse off than before. Why? Draw a diagram to illustrate your answer.

3. Below is some data for Jones.
    Year 1: $p_x = 15$, X = 20, $p_y = 25$, Y = 30.
    Year 2: $p_x = 6$, $p_y = 30$, Income = 1050.
    In which year is Jones better off? Why?

4. Suppose Jane eats cheese sandwiches, using precisely two slices of bread and two slices of cheese to make one sandwich.
    (a) By finding the demand function for cheese, derive formulae for the elasticity of demand for cheese, the cross-price elasticity of demand for cheese with respect to the price of bread, and the income elasticity of demand for cheese.
    (b) What would be the values of these elasticities if the price of a slice of bread is equal to the price of a slice of cheese? Verify that the sum of these three elasticities is zero.
    (c) What would be the values of the elasticities if the price of a slice of cheese was twice the price of a slice of bread?

5. In 2011, X cost \$2 and Tom bought 500 units, while a related good Y cost \$10 and Tom bought 200 units. In 2012, X still cost \$2 but Tom now bought 600 units, while Y now cost \$12 and Tom bought 150 units. What is Tom's cross-price elasticity of demand for X with respect to the price of Y?

6. Farmer Joe is an apple grower, whose only source of income is his apple crop of A_0, which he can sell at the going price of p_a. His utility function depends on the quantities of the only two goods he consumes, apples and bananas, according to

    $U(A,B) = AB.$

(a) Find Farmer Joe's demand functions for apples and bananas.
(b) Find Joe's own- and cross-price elasticities of demand for both A and B.

7. Bill is a utility maximizer, and his utility function is $U=y^{1/2}\,T$, where y=quantity of "goods" consumed per day and T=non-working hours per (24-hour) day. The price of "goods" is $1.50 per unit.

    (a) Let the wage rate be $w per hour. How many hours will Bill work?

    (b) Suppose the current wage rate is $5 per hour. Bill's boss wants him to work more than the number of hours he is presently working, and offers a 10% raise. What is Bill's reaction? Explain.

    (c) Suppose his boss decides to maintain Bill's regular wage at $5 per hour, for the first 8 hours worked, and then pay an overtime rate thereafter. What overtime rate would he have to offer Bill to get him to work 10 hours per day? (Hint: Write down Bill's constraint now as a function of the number of overtime hours, x and the overtime wage, v. Then find Bill's optimal x (or T) as a function of v. Finally, find the value of v that would induce x=2.)

8. The diagram at right shows Andrew's supply curve for labor. On the vertical axis is the hourly wage rate, and on the horizontal axis is the number of hours worked per day. Suppose w_o is the wage rate.
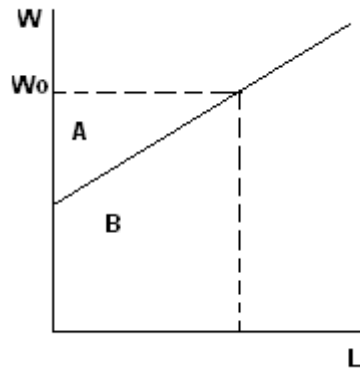
    (a) What is the economic interpretation of the two areas A and B in the diagram?

    (b) Suppose the equation of Andrew's supply curve is
    $$L = -1 + w/2,$$
    where w is the hourly wage rate and L the number of hours of work per day. How many hours would Andrew work per day if the wage rate were $10 per hour?   What wage rate would induce Andrew to work 8 hours per day? What would then be his daily earnings?

    (c) If the going rate in the market were $10 per hour, and a firm offered Andrew a job that would require him to work 8 hours per day at a daily salary of $90, would he accept? Explain your reasoning carefully.

9. Evaluate the following statement in the context of the two-period inter-temporal choice model: "A rise in the interest rate would unambiguously lead consumers to consume less in the present and more in the future." State whether this is true or false and explain clearly the reasons for your answer.