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ECON 201 - Problem Set 7

1. Sam's utility function is $U(x, y) = x + 10y - \frac{y^2}{2}$. Sam has \$200 a week to spend. The price of x is \$1 and the price of y is currently \$5 per unit. Sam has received an invitation to join a club devoted to the consumption of y. If he joins the club, Sam can get a discount on the purchase of y. If he belonged to the club, he could buy y for \$1 a unit. How much is the most Sam would be willing to pay to join this club?

2. A consumer has a utility function:

$$u(x_1, x_2) = \sqrt{x_1 x_2}$$

Assume that he originally faces prices (1, 1) and has income 100. Then the price of good 1 increases to 2. What are the compensating and equivalent variations?

3. Saga's utility function is $U(x, y) = \min\{x, y\}$. Saga has 150 kr and the price of x and the price of y are both 1 kr. Saga is currently living in Stockholm but Saga's boss is thinking of sending her to Copenhagen where the price of x is 1 kr and the price of y is 2 kr. The boss offers no raise in pay. Saga, as a completely rational human being, understands compensating and equivalent variation perfectly, and complains bitterly. She says that although she doesn't mind moving for its own sake and the new town is just as pleasant as the old, having to move is as bad as a cut in pay of A kr. She also says she wouldn't mind moving if when she moved she got a raise of B kr. What are A and B?

4. Suppose a consumer with well behaved preferences purchases food (F) and other goods (X) with her income of \$100. For simplicity, suppose the price of each good is \$1. Currently, the consumer can purchase unlimited food stamps by paying 10 cents for \$1 of food. With this, the consumer purchases 500 food stamps (for 500 units of food) and 50 units of X. As a result, the government must pay 90 cents towards food, for a total cost of \$450. Using a graph of budget constraints and indifference curves, show that the consumer prefers to receive a cash gift of \$450 over the food stamp option.

5. William has \$300 to spend on food and clothing. The price of food is \$2 per unit and the price of clothing is \$1 per unit.

(a) Write down the equation for William's budget constraint and graph it.

(b) Suppose that the government gives William 100 free coupons as food stamps (assuming that William can get free unit of food for each coupon) and strictly enforce a rule which prohibits William from selling his food stamps to someone. Draw the new budget set.

(c) Suppose that the rule prohibiting the food stamps sale is difficult to enforce and William can trade each food stamp in black market for \$0.50. Draw his budget set.

(d) Suppose that in addition to 100 units of food stamps, government also gives 50 free coupons for clothing (each coupon can be used for a free unit of clothing). Assume that trading both coupons in black market can be prohibited. Draw the budget set.

6. A consumer has the following utility over coal (c) and food (f):

$$u(c, f) = c^{\frac{1}{5}} f^{\frac{4}{5}}$$

The price of coal is $p_c = 2$, the price of food is $p_f = 4$ and income is $I = 20$.

(a) What is the consumer's demand for food and coal?

(b) Suppose the government gives the consumer an income subsidy of $S = 10$. How will the consumer allocate the subsidy in the consumption of food and coal?

(c) Suppose now the government decides to give an in-kind transfer to the consumer. The in-kind transfer takes the form of 4 units of coal and 0.5 unit of food. Assume that the transfer cannot be re-sold. What are the new consumption levels after the in-kind transfer is given? What is the level of utility attained by the consumer at this consumption level?

(d) Suppose that instead of in kind transfer of coals and food, the government decides to provide income subsidy to those in need. What is the cash equivalent of the in-kind transfer? [That is, the cash transfer that the government could give to provide the same level of utility to the consumer as the in-kind transfer]

7. Jonas' utility for daily leisure hours (n) and consumption (c) is $u(n, c) = n \cdot c$; she can work for a wage rate of \$8 per hour and labor is her only source of income. Suppose that the price of the consumption per unit is \$1.

(a) Write Jonas' daily budget constraint assuming there are only 24 hours in a day.

(b) Find Jonas' demand for leisure and consumption. What is her labor supply hours?

(c) Suppose that wage rate raises to \$10. How does wage rate increase affect her labor supply amount?

8. Consider Noah's preference for leisure (n) and consumption goods (c), $u(n, c) = n^{\frac{1}{2}} + c^{\frac{1}{2}}$. Assume that Noah's only source of income is labor, and the price for consumption good is \$1 per unit. Suppose the maximum number of available hours is $\bar{n}$. Is Noah's labor supply backward bending? That is, after a certain level of wage rate, does his labor supply start to decrease as wage is getting higher?

9. Ulrich's utility function over leisure (n) and consumption goods (c) is $u(n, c) = c + nc$. Assume that Ulrich's only source of income is labor. Find the optimal working hours and show that, no matter what the wage rate is, the optimal number of labor hours is always the same.

10. Marta's utility function is $u(n, c) = c - (12 - n)^2$, where n is the amount of leisure she gets per day, and she has 16 hours a day to divide between labor and leisure. She has an income of \$ m a day from non-labor source. The price of consumption goods is \$1 per unit.

(a) If wage rate is zero, how many hours of leisure will she choose? How many hours will she work?

(b) If wage rate is \$10 per hour, how many hours of leisure will she choose? How many hours will she work?

(c) If Marta's non-labor income decreased to \$ $\frac{m}{2}$ a day while wage rate remained at \$10, will her optimal working hours be different than part (b)?

(d) Suppose that Marta has to pay an income tax of 20 percent on all of her income, and suppose that her before-tax wage is \$10 per hour and her before-tax non-labor income is \$20 per day. How many hours would she choose to work? What is the optimal consumption level?