Midterm 1

This is a 90-minute exam, with closed books and notes. No calculators allowed. Remember to label your graphs and show your work.

GOOD LUCK!

1 Utility maximization

Assume that a consumer lives on peanut butter jelly sandwiches. He is very peculiar of his sandwiches, and wants to have exactly 1 oz. of jelly for each 2 oz. of peanut butter, hence his utility is described by $U(j, b) = \min\{2j, b\}$. He has a weekly budget of \$16 to use for food, and he buys only these two commodities with it (the bread is provided by a concerned neighbor). The prices are $P_b = 1$ and $P_j = 2$.

(a) In a clearly labeled graph, draw three indifference curves for this consumer so that jelly is on the horizontal and peanut butter on the vertical axis.

(b) Derive the optimal consumption choice.

(c) If the price of jelly increases to \$3, derive the new optimal consumption choice.

(d) What part of the change in demand is due to the income and what part due to the substitution effect?

2 Income and substitution effects

A consumer has a budget of $I = 16$ to use for goods x and y. The initial prices are $P_x = P_y = 1$. Her preferences can be described with a Cobb-Douglas utility function, $U(x, y) = xy$ which gives rise to the following demand functions:

$$x(P_x, P_y, I) = \frac{I}{2P_x} \quad \text{and}$$
$$y(P_x, P_y, I) = \frac{I}{2P_y} \quad \text{and}$$

(a) What is the optimal consumption bundle, and the level of utility that the consumer reaches with this bundle?

(b) If the price of x increases to $P_x = 4$, what is the new optimal consumption point? Given the new prices, determine what is the new income required to reach the original level of utility, and what would be the optimal consumption point in this case.

(c) What are the income and substitution effect of the price change?

3 Quasi-linearity

Suppose the utility function $U(x, y) = x + ln(y)$ represents someone's preferences for goods x and y. Let I denote income, p_x the price of x and p_y the price of y. (Remember that the derivative of $ln(y)$ is $1/y$.)

(a) Calculate the marginal rate of substitution and show why at the optimal consumption point it must be equal to the relative price of x and y.

(b) Derive the optimal demands for x and y as functions of income and prices.

(c) As you (should) see from b), the income elasticity of the demand for good y is zero. Show that the income elasticity for good x must be greater than one and explain in words why this is so.

4 Food and Other Goods

Suppose there are two commodities: food and a broad category of other stuff. The national elections are coming up and different parties offer different ideas on how to make food more affordable.

(a) The blue party proposes to subsidize the price of food, that is, instead of the regular price p_f people would pay $p_f - s$ for every unit of food they decide to buy. Graphically show how this program would change the budget constraint and the demand for food.

(b) The red party promises a certain quantity of food for free but would leave the price of food unchanged at p_f. Again, depict how this proposal would change the budget constraint and the demand for food.

(c) Assuming that both parties would have the same budgetary means available for their respective programs, which party should the econ-savvy voter prefer? Explain your answer using a graph containing both budget constraints and indifference curves.

Remember to label your graphs, including intercepts and slopes of budget lines. Also, put food on the horizontal axis, and the composite good ("other goods") on the vertical axis.