

Econ 431-01: Public Finance
Prof. Sarah West
50 points

1. (5 points) Joanne has a disposable income of \$800 per month. She spends her income on movies at the Grandview Theater and on music downloads. The price of a movie is \$12, and the price per music download is \$2.00.

a. Graph Joanne's monthly budget constraint. Assume that at the original prices, she spends half her income on movies and half on music downloads. Draw an indifference curve representing this consumption. Why did you draw your indifference curve in the way you did?

b. Movies go on sale for \$8.00 each. Draw Joanne's new budget constraint and an indifference curve that reflects the fact that for Joanne, the income effect of the price change dominates the income effect. Label the income and substitution effects on both axes, and explain.

2. (5 points) Tim consumes two goods, x and y , whose prices are respectively p_x and p_y . His income is I . Tim's utility function can be represented as:

$$U = x^{1/3} y^{2/3}$$

a. If Tim gains one unit of good x , how much less of good y must he consume to hold his utility constant? Explain.

b. Use the Lagrangian optimization technique to derive expressions for Tim's demand for each of the two goods in terms of prices and income.

c. Show that the log-log form of this utility function yields the same demands.

d. If Tim's utility function is instead given by the following equation, how much of good x and how much of good y will he consume?

$$U = \min(4x, 5y)$$

3. (9 points) Your professor does research on the demand for gasoline. She asks for help interpreting the following regression results, where g equals gallons of gasoline, P_g is the price of gasoline, I is income, and standard errors are in parentheses:

$$\log g = .25 - .56 \log P_g + 1.8 \log I \quad \text{adjusted } R^2 = .28 \quad n = 462$$

(.02) (.29) (.50)

a. Are the estimated coefficients statistically significant? Use t-statistics in your explanation.

b. If the price of gasoline decreases by sixty percent and incomes remain the same, by how much will gasoline consumption change? According to these coefficients, is gasoline a necessity or a luxury? Explain.

c. How well does this regression explain the variance in gasoline consumption? Can you suggest any ways in which your professor could improve the regression's accuracy?

4. (12 points)

a. Find and describe an example of a public good and an externality on Macalester's campus. Choose your externality so that it is not also a public good or a public bad, and explain why your externality is not a public good or public bad.

5. (13 points) Consider an economy with two people, each of whom consumes one private good, x , and one public good, G . Person 1's utility can be represented:

Consider an economy with two people, each of whom consume one private good, x , and one public good, G . Person 1's utility can be represented:

$$U_1 = \alpha(x_1 + G)$$

while person 2's utility can be represented:

$$U_2 = \beta(x_2 + G)$$

The private good and the public good are produced according to the production function:

$$F(X, G) = 0, \text{ where } X = x_1 + x_2$$

The government's social welfare function is:

$$W = 2U_1 + U_2$$

a. Set up and solve the government's optimization problem. What condition characterizes the social optimum? Be sure to use the functional forms given above in your derivation of the optimum. Explain.

b. How does the condition for which you solved in part (a) differ from the optimum condition in the case of a market with only private goods? Why do these conditions differ?

c. What does your solution in (a) imply for policymakers? How should policymakers decide how much of a public good to provide? What problems will policymakers likely have in determining how much to provide?

6. (6 points) Rosen and Gayer, page 107, problem 11.