# Problem Set 2

Econ 3010, Fall 2017

**Problem 1: Cobb Douglas**

Let I, $p_x$ and $p_y$ represent income and prices. Suppose $U(x, y) = x^a y^b$ where a, $b > 0$.

a) Calculate the MRS.

b) Find the optimal bundle and use a graph to depict the optimum.

c) Calculate the elasticity of demand for good x and for good y.

d) Calculate the cross price elasticity for good x and for good y.

e) Calculate the income elasticity for good x and for good y.

**Problem 2: Perfect Substitutes**

Let I, $p_x$ and $p_y$ represent income and prices. Suppose $U(x, y) = ax + by$ where a, $b > 0$.

a) Calculate the MRS.

b) Find the optimal bundle and use a graph to depict the optimum.

c) Calculate the elasticity of demand for good x and for good y.

d) Calculate the cross price elasticity for good x and for good y.

e) Calculate the income elasticity for good x and for good y.

**Problem 3: Perfect Compliments**

Let I, $p_x$ and $p_y$ represent income and prices. Suppose $U(x, y) = \min\{ax, by\}$ where $a, b > 0$.

a) Calculate the MRS.

b) Find the optimal bundle and use a graph to depict the optimum.

c) Calculate the elasticity of demand for good x and for good y.

d) Calculate the cross price elasticity for good x and for good y.

e) Calculate the income elasticity for good x and for good y.

**Problem 4: Quasi-Linear**

Let I, $p_x$ and $p_y$ represent income and prices. Suppose $U(x, y) = -x^{-1} + y$.

a) Calculate the MRS.

b) Find the optimal bundle and use a graph to depict the optimum.

c) Calculate the elasticity of demand for good x and for good y.

d) Calculate the cross price elasticity for good x and for good y.

e) Calculate the income elasticity for good x and for good y.

**Problem 5: Demand and Income**

Bob has an income of I and likes to consume apples and bananas. Bob faces prices $p_a$ and $p_b$ for apples and bananas respectively. Bob's utility function for apples and bananas is $U(a, b) = \ln(a) + 2 * \ln(b)$.

a. Solve for Bob's optimal bundle given this information. Fully characterize the solution.

b. Let pa = 1 and pb = 4. Give the equation for the Engel curve as well as the optimal values of a and b in terms of I. Graph both the Engel curve and income consumption curve using the same kind of two-panel diagram that was used in class.

c. Let I = 4 and pb = 4. Give the equation for the demand curve as well as the optimal values of a and b in terms of pa. Graph both the demand curve and price consumption curve using the same kind of two-panel diagram that was used in class.

**Problem 6**: For the utilities in Problem 1, 2, 3 and 4, solve for the Engel Curves, Demand Curves, PCC, ICC. Graph your answers.