Problem Set 1

1. Consider the utility function $U(x, y) = 3x + y$.

   a. Calculate the marginal utility of x (MU_x) and the marginal utility of y (MU_y).

   b. Is the assumption that more is better satisfied for both goods? Relate your answer to the marginal utilities calculated in part a.

   c. Does the marginal utility of x diminish, remain constant, or increase as the consumer buys more x?

2. Repeat Problem 1 for the Cobb-Douglas utility function $U(x, y) = A x^\alpha y^\beta$, where A, α, and β are positive constants.

3. Britney and Kevin consume two goods with following utility functions:

$$U^{Britney} = (x + y)^2$$

$$U^{Kevin} = x + y$$

   Britney and Kevin will have the same ordinal ranking of different baskets if, when basket A is preferred to basket B by one of the functions, it is also preferred by the other. Do Britney and Kevin have the same ordinal ranking of different baskets of x and y? Explain.

4. Graph a typical indifference curve for the following utility functions and determine whether they obey the assumption of diminishing MRS:

   a. $U(x, y) = 3x + y$

   b. $U(x, y) = \sqrt{x y}$

   c. $U(x, y) = \sqrt{x^2 + y^2}$

   d. $U(x, y) = \sqrt{x^2 - y^2}$

   e. $U(x, y) = x^{2/3} y^{1/3}$

   f. $U(x, y) = \ln x + \ln y$

5. Suppose a consumer's preferences for two goods can be represented by the Cobb-Douglas utility function $U(x, y) = A x^\alpha y^\beta$, where A, α, and β are positive constants.

   a. What is $MRS_{x,y}$?

   b. Is $MRS_{x,y}$ diminishing, constant, or increasing as the consumer substitutes x for y along an indifference curve?

   c. On a graph with x on the horizontal axis and y on the vertical axis, draw a typical indifference curve. Indicate on your graph whether the indifference curve will intersect either or both axes.

6. For the following sets of goods draw two indifference curves U_1 and U_2 with $U_2 > U_1$. Draw each graph placing the amount of the first good on the horizontal axis.
   a. Hot Dogs and Chili (the consumer likes both and has diminishing $MRS_{H,C}$)
   b. Sugar and Sweet'N Low (the consumer likes both and will accept an ounce of Sweet'N Low or an ounce of sugar with equal satisfaction)
   c. Peanut butter and jelly (the consumer likes exactly 2 ounces of peanut butter with one ounce of jelly)
   d. Nuts (which the consumer neither likes nor dislikes) and ice cream (which the consumer likes)
   e. Apples (which the consumer likes) and liver (which the consumer dislikes)

7. Naomi always eats bagels with 1 ounce of cream cheese. Each bagel eaten in this way provides 15 units of utility. Excess cream cheese or excess bagels do not add to Naomi's utility. Explain the nature of Naomi's utility function and indicate the form of her indifference curve map.

8. Repeat Problem 5 for the quasi-linear utility function $U(x, y) = 2\sqrt{x} + y$.