Economics 202
Professor Smith

Problem Set #2

Section I – True/False with Justification

1. The utility function $U(x,y) = x^2 + 2xy + y^2$ treats goods x and y as perfect substitutes.

2. For any set of preferences, there are an infinite number of utility functions that will describe those preferences mathematically.

Section II – Problems on Preferences and Utility Functions

3. Verify that each of the following statements is true. Show your work!

   a) The MRS for the utility function $U(x,y) = x^a y^b$ is the same as the MRS for the utility function $U(x,y) = 10x^a y^b + 2000$.

   b) The MRS for the utility function $U(x,y) = x + y$ is the same as the MRS for the utility function $U(x,y) = (x + y)^3$.

   c) The MRS for the utility function $U(x,y) = x^3 y^3$ is the same as the MRS for the utility function $U(x,y) = a^3 x^{10} y^{10}$.

4. For each of the utility functions below, complete all of the tasks in this list:

   - Graph the indifference curves for $U = 16$ and $U = 36$.
   - Provide a brief description of the type of preferences described by the utility function. (For example, perfect complements preferences "say" that the individual likes to consumer goods in fixed proportions.)
   - Determine if the preferences satisfy the property of monotonicity (more is better)
   - Find the expression for the Marginal Rate of Substitution.

   a) $U(x,y) = xy + y$
   b) $U(x,y) = -(x + y)$
   c) $U(x,y) = x^2 y^2$
   d) $U(x,y) = x^2 + y^2$
   e) $U(x,y) = Max\{x,y\}$

Section III – Problems on Optimal Choice

5. Sam, a representative consumer, buys two goods – milkshakes and books. (Make milkshakes good x and books good y.) If Sam has income of $100, the price of milkshakes is $2, and the price of books is $5, then find Sam's utility maximizing bundle for each of the following utility functions.

   a) $U(x,y) = 10x + 5y$
   b) $U(x,y) = x^{1/4}y^{3/4}$ - Use Lagrange's method to solve this problem.
   c) $U(x,y) = Min\{x, 2y\}$
   d) $U(x,y) = x^{1/2} + y$
   e) $U(x,y) = xy + x$
   f) $U(x,y) = x - y$
   g) $U(x,y) = x^2 + y^2$ - Hint: Do not use Lagrange's method, and make sure to draw some indifference curves.