Econ 303 - Intermediate Microeconomic Theory
College of William and Mary February 13, 2013
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Midterm 1

You have until 1:50pm to complete the exam, be certain to use your time wisely. Answer all questions directly on the exam. You must show all of your work to receive full credit. Calculators may be used although you may leave answers as fractions. Unless a problem says otherwise, you can assume that firms can produce fractions of units and charge non-integer prices (so a firm could produce 82.4 units and sell at a price of \$5.325 per unit). Remember to put your name on the exam. Good luck!

Name: **ID Number:**

1. (25 points) Arnold consumes only books and magazines. For each scenario below, draw a graph of Arnold's budget constraint. You should use a separate graph for each scenario. In each case, books should be on the horizontal axis and magazines should be on the vertical axis. You must label all endpoints, kinks and slopes with their numerical values for full credit:

   (a) Arnold has \$100 to spend. The price of a book is \$10 and the price of a magazine is \$2.

   (b) The prices and income are the same as in part (a) only now the bookstore runs a special where books are three for the price of two. (Note: This special works for any number of books. For example, you would get 1.5 books for the price of one.)

   (c) The prices and income are the same as in part (a) only now the bookstore will take 10% off of Arnold's entire purchase, both books and magazines, if he spends at least \$50 on books.

2. (25 points) Bob's preferences for chocolate and bananas exhibit the following properties:

   - The marginal utility of chocolate and the marginal utility of bananas are both always positive.
   - Bob's optimal bundle always contains positive quantities of both chocolate and bananas.
   - Chocolate and bananas are complements.
   - Bob's income offer curve has a positive slope.

   On a graph with chocolate on the horizontal axis and bananas on the vertical axis, show the change in chocolate due to the substitution effect and the change in chocolate due to the income effect when the price of bananas decreases. Label the change in chocolate due to the income effect ΔC_{inc} and the change due to the substitution effect ΔC_{sub} Be certain to clearly label all relevant consumption bundles, budget lines and indifference curves. If you need to make any additional assumptions about the two goods, state them clearly and succinctly. (Note that you will not be able to provide numerical values for anything on the graph.)

3. (30 points) Christine's marginal utility from oranges, MU_O, and her marginal utility from kiwis, MU_K, are given by the following functions:

$$MU_O(O,K) = \frac{4}{O^{\frac{1}{2}}} \tag{1}$$

$$MU_K(O,K) = \frac{1}{K^{\frac{1}{2}}} \tag{2}$$

   (a) Derive an expression for Christine's demand for kiwis as a function of her income and the prices of oranges and kiwis: $K(I, p_O, p_K)$.

   (b) Sketch the Engel curve and the demand curve for kiwis. Label any intercepts and kinks with their values in terms of I, p_O and p_K. Also label the slopes of any linear segments on these graphs with their values in terms of I, p_O and p_K.

   (c) Christine gets 40 utils of utility from consuming the bundle (16 oranges, 16 kiwis). She also gets 40 utils of utility from the bundle (4 oranges, 144 kiwis). Would the bundle (10 oranges, 80 kiwis) give her more than 40 utils or less than 40 utils of utility? Be certain to fully justify your answer.

4. (20 points) Suppose that water and coffee are the only two beverages Donald can purchase. Donald likes water but each additional glass of water increases his utility by a smaller amount than the previous one did. Donald does not like coffee. Each cup of coffee he drinks reduces his utility by five units.

   (a) Write down a utility function that is consistent with Donald's preferences.

   (b) On a graph with coffee on the horizontal axis and water on the vertical axis, sketch three indifference curves representing Donald's preferences.

   (c) Derive functions for Donald's demand for water as a function of income and prices, $W(I, p_W, p_C)$, and Donald's demand for coffee as a function of income and prices, $C(I, p_W, p_C)$.