Econ 303 - Intermediate Microeconomic Theory
College of William and Mary September 26, 2013
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Midterm 1

You have until 4:50pm 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 individuals can consume fractions of units. Remember to put your name on the exam. Good luck!

Name: **ID Number:**

1. (25 points) Barry's preferences over gummy worms, G, and twizzlers, T, are given by the following utility function:

$$U(G,T) = 3G^{\frac{2}{3}} + 6T^{\frac{2}{3}} \tag{1}$$

   (a) Determine whether Barry's preferences are convex or not. Be certain to fully justify your answer.

   (b) Derive an expression for the optimal number of gummy worms as a function of income, the price of a gummy worm and the price of a twizzler, $G(I, p_G, p_T)$.

   (c) Determine whether twizzlers are a normal or inferior good and whether they are a substitute or complement for gummy worms. Be certain to fully justify your answer.

   (d) Suppose that gummy worms cost one dollar each and twizzlers cost two dollars each. Graph the Engel curve for gummy worms being certain to label all intercepts and slopes with their numerical values.

2. (25 points) Aaron enjoys watching both half-hour sitcoms and one-hour dramas. These are the only two types of shows that Aaron watches. During a typical week Aaron has ten hours to watch television. On weeks when he has more time, he watches both more sitcoms and more dramas.

   (a) Write down a budget equation giving the affordable bundles of sitcoms, S, and dramas, D, for a typical week of TV viewing. S and D should be the only variables in your equation, everything else should be numerical constants. Show this budget line on a graph with sitcoms on the horizontal axis and dramas on the vertical axis. Be certain to label the intercepts and slope with their numerical values.

   (b) Suppose that Aaron purchases a DVR that allows him to skip commercials. Commercials make up ten percent of the total running time of both sitcoms and dramas. On the same graph as part (a), show how this changes Aaron's budget line. Once again, be certain to label all intercepts and slopes of the new budget line with their numerical values.

   (c) Will the purchase of the DVR increase or decrease the number of sitcoms Aaron watches and will it increase or decrease the number of dramas he watches? Be certain to fully explain your answer. If the answer is ambiguous, explain what additional information you would need to determine the direction of change.

   (d) Suppose that the impact of an additional sitcom on Aaron's utility is bigger if he is watching a lot of dramas (he appreciates the break from all of the seriousness of the dramas). The impact of an additional sitcom on his utility is smaller if he is watching very few dramas. The impact of an additional drama on his utility does not depend on the number of dramas he is currently watching. Write down a utility function that is consistent with Aaron's preferences. Your function should contain only the number of sitcoms, S, the number of dramas, D, and numerical constants. It shouldn't include any other variables or parameters.

3. (20 points) For each scenario below, draw three indifference curves consistent with the description of the preferences over the two goods in question. Where possible, include numerical values for slopes. Be certain to clearly label which axis is which and indicate the direction in which utility is increasing.

   (a) Candice hates mice, M, and she hates spiders, S. The effect of each spider on Candice's utility is twice as large as the effect of each mouse regardless of how many mice and spiders she currently has.

   (b) Darla likes both milk, M, and cookies, C. The marginal utility Darla gets from each glass of milk is 5 utils (units of utility). The marginal utility of cookies is increasing as the number of cookies increases.

   (c) Elizabeth likes reading books, B. Each additional book always increases Elizabeth's utility but at a diminishing rate. Elizabeth does not read magazines, M. Having more magazines has no impact on her utility.

   (d) Frederick likes to run and bike. Every mile of running, R, up to ten miles increases Frederick's utility. After that, Frederick gets tired and additional miles actually reduce his utility. The same thing is true of biking miles, B, except that additional biking increases Frederick's utility up to thirty miles and then decreases it after that.

4. (30 points) Gary's utility from football tickets, F, and money spent on other things, M, is given by the following utility function:

$$U(F, M) = 20F^{\frac{1}{2}} + M \tag{2}$$

The price of a football ticket is \$2 and Gary has \$200 to spend.

(a) Determine the number of football tickets Gary will buy.

(b) Graph Gary's price offer curve, labeling the points that correspond to prices of football tickets equal to \$0.25, \$0.50, \$1, and \$2.

(c) Graph Gary's demand curve for football tickets, labeling any slopes and kinks with there numerical values where possible.

(d) Show that the utility function of $V(F, M) = 400F + M^2 + 40F^{\frac{1}{2}}M$ also represents Gary's preferences.