Econ 301 Practice Midterm Examination

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Instructions: *Please answer all five questions. The exam lasts 2 hours. Calculators are not allowed. Show the work with which you obtain all your answers. If you cannot completely solve a problem, you can still obtain points by providing graphs or equations that explain how you would approach the problem. Begin answers to each question on a new page. Indicate before each answer which question you are answering.*

1. (12 points) TRUE or FALSE. Explain whether each of the following statements is true or false, and why.

   a. In a well-organized market, there are only two goods: sugar and coffee. All consumers consume strictly positive amounts of sugar and coffee in their optimal choice. Then, there is no way for any two persons to trade with each other and both become strictly better off.

   b. Garfield is strictly happier when he eats more lasagna and has more sleep. Based on this information, Garfield's preferences over lasagna and sleep are complete.

   c. A consumer consumes apple pie and ice cream. She considers them perfect complements to each other. Then, she must become strictly worse off when the price of ice cream increases.

   d. The following function is a monotonic transformation when $u > -1$:
   $$f(u) = -\frac{1}{(u+1)^2}.$$

2. (8 points) Answer the following two questions.

   a. Ms. Undecided is a US voter. She prefers Obama to McCain, McCain to Hillary, and Hillary to Obama. Can we represent her preferences over presidential candidates with a utility function? Explain.

   b. Teddy Sweettooth is always willing to give up 20 grams of honey for 10 grams of chocolate. Write down two utility functions that represent Teddy's preferences. Now, draw three indifference curves of his and label them with the utility levels (pick one utility function from the two you wrote).

3. (12 points) A consumer spends all her income on two goods: salt (good 1) and "all other goods" (good 2). We know that her demand function for good 2 is

$$x_2(p_1, p_2, m) = \begin{cases} 0, & \text{if } m \leq 10; \\ \frac{m-10}{p_2}, & \text{if } m > 10. \end{cases}$$

   a. Please calculate her demand for salt, $x_1(p_1, p_2, m)$.

   b. Are her preferences homothetic? Why or why not?

   c. Is good 1 a normal good or an inferior good? Is it a Giffen good or an ordinary good? Explain.

4. (12 points) The following utility functions are each of the quasi-linear type:

$$u(x_1, x_2) = \ln x_1 + x_2; v(x_1, x_2) = 2\sqrt{x_1} + x_2.$$

   (a) Are they monotonic transformations of each other?

   (b) Suppose the consumer has income $m = 10$, and suppose the prices are $p_1 = 1$ and $p_2 = 2$. How much of each good does she optimally consume under either type of preferences?

   (c) Now, holding p_1 and p_2 fixed, let the consumer's income increase to $m' = 15$. How does it affect her optimal consumption bundle under either type of preferences?

5. (16 points) Consider the utility function $u(x_1, x_2) = \ln x_1 + \ln x_2$, where x_1 is food and x_2 is alcohol.

   a. If you do not like logs (because you want to conserve the forests, maybe), you can use the function $v(x_1, x_2) = (x_1)^{1/2}(x_2)^{1/2}$ as the consumer's utility function. Why?

   Now, pick your favorite utility function from above and proceed to answering the following questions.

   b. Suppose $p_1 = \$2/\text{unit}$, $p_2 = \$2/\text{unit}$, and the consumer's income is $m = \$60$. Write down the budget constraint. Derive the consumer's optimal consumption bundle.

   c. Suppose the government provides a subsidy of \$1/unit on food, and collects a tax of \$1/unit on alcohol. What is the new budget constraint? What is the consumer's optimal consumption bundle after the policy change?

   d. Recall that utility functions tell us how a consumer ranks any two consumption bundles. Is the consumer better off or worse off after the policy change?

   e. (2 bonus points, you may answer this question without knowing solutions to parts (b) through (d)) Do you think this is a good model to study the effect of the government's proposed policy change? Explain.