Econ 73-250A-F
Spring 2001
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Problem Set #2

As indicated on the course syllabus, this problem set is due at the beginning of your recitation section on Friday, February 9.

Exercise #1. Anna's preferences over consumption bundles (x_1, x_2) are summarized by the utility function $U(x_1, x_2) = x_1(x_2 + 1)^2$.

(a) Derive an algebraic expression for the marginal utility $MU_1(x_1, x_2)$ of good 1.

(b) Derive an algebraic expression for the marginal utility $MU_2(x_1, x_2)$ of good 2.

(c) Use your answers from parts (a) and (b) to derive an algebraic expression for Anna's marginal rate of substitution (MRS) of good 2 for good 1. If Anna is currently consuming 3 units of good 1 and 5 units of good 2, what is the value of her MRS?

(d) Suppose again that Anna is currently consuming the bundle (3,5). Is Anna willing to exchange 1 unit of good 2 for 1 unit of good 1? [Hint: notice that an extra 1 unit of good 1 in this context is not a marginal change. Evaluate Anna's utility at the bundle (3,5) and the bundle (4,4) to realize she is not indifferent between the two.]

(e) Suppose now that Anna is currently consuming 27 units of good 1. How many units of good 2 must she consume in order to leave her just as well off as she was in part (c)? What is the value of Anna's MRS at this consumption bundle? Compare your answer to the corresponding answer in part (c). Are your answers consistent with the convexity of Anna's preferences?

Exercise #2. The government of Bahnanas collects every year 10 million Bahnanas dollars (B$) worth of taxes. The constitution of the state of Bahnanas requires that in each year the government's budget be balanced. At the beginning of 1999 the government has to decide how to allocate tax revenues to two purposes. The government can pay down a certain amount of national debt. Let x_d denote how many millions of dollars are allocated to the payment of the national debt in 1999. The government can also contribute, to some extent, to its 1,000,000 citizens' medical expenditures. The government has computed that during 1999 around 50% of its population will make an appointment (and only one) with a doctor. Each visit to a doctor costs B$100. The government's health plan will cover a certain fraction x_h of the cost of a visit to a doctor. Notice that this variable is measured in percentage terms (e.g.: a value of 1 indicates 100% coverage).

The government's budget line then reads (choose units so that all numbers in this equation represent millions of B$)

$$10 = x_d + 50x_h.$$

The constitution of Bahnanas grants the prime minister the authority of choosing x_d and x_h. His preferences over policy bundles (x_d, x_h) are represented by the Cobb-Douglas utility function:

$$u(x_d, x_h) = 1000\left(x_d^{\frac{1}{2}} x_h^{\frac{1}{2}}\right). \tag{1}$$

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(a) What is the "relative price" of x_d in terms of x_h from the prime minister's point of view?

(b) Find the policy bundle that maximizes the prime minister's utility subject to the government's budget constraint.

(c) What is the share of the government's 1999 budget that the prime minister decides to spend on health care?

(d) How would your answer to question (c) change if the prime minister's preferences were represented by the following utility function:

$$v(x_d, x_h) = 0.5 \log(x_d) + 0.5 \log(x_h),$$

instead of the one in equation (1)?

Exercise # 3. Do Problem 5.5 in the Workouts book. Do not hand in the sheets from the Workouts book; write your answers instead on a separate sheet to be handed in. Be sure to show your work.