MID-TERM 2, ECON500, (YELLOW) November 7, 2007

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All questions must be answered on this test form!
For each question you must show your work and (or) provide a clear argument.
All graphs must be accurate to get credit.

Question 1 Suppose that a person's utility function is $u(x_1, x_2) = x_1 x_2^2$. Prices are $p_1 = 1$, $p_2 = 3$ and income is $I = 180$.

The Lagrangean is given by *5 points*

The equation of the income offer curve is $x_2 =$. *5 points*

The optimal consumption choice is

$x_1 =$, $x_2 =$. *5 points*

Question 2 A utility function is given by $u(x_1, x_2) = x_1^2 x_2$. Suppose prices are $p_1 = 1$, $p_2 = 2$. Determine the least costly consumption bundle that gives the person a utility of 2,000. *15 points*

The Lagrangean is given by

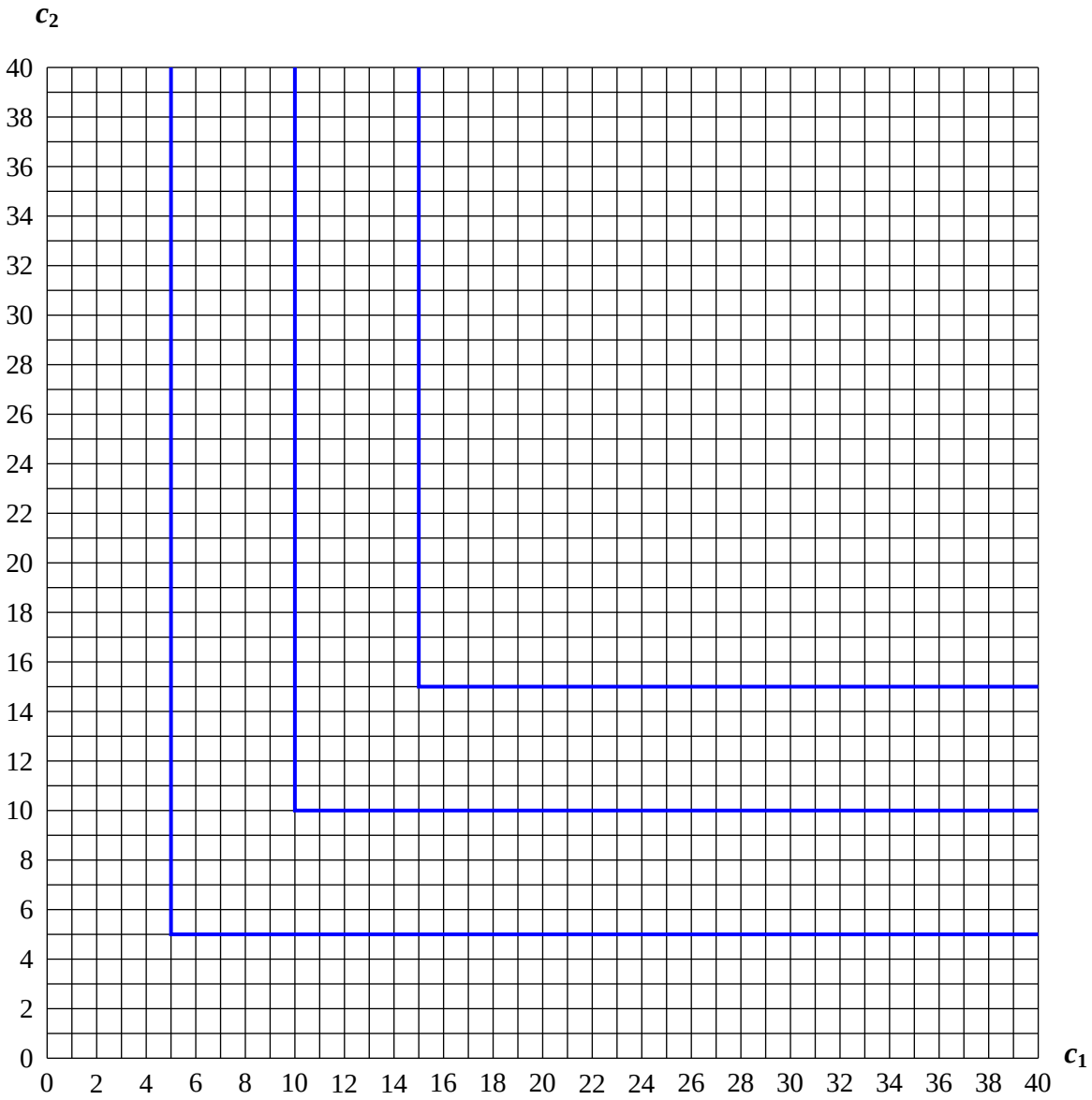
The least costly consumption bundle is $x_1 =$, $x_2 =$

Question 3 Suppose a consumer's preference between current consumption, c_1, and future consumption c_2 are given below. The person has an income of 20 Dollars in the first period. In the second period, the person retires, i.e., his income is 0 and he has to finance consumption from saving. If the interest rate is r then the equation of the budget line is

$$c_1 + \frac{c_2}{1+r} = 20,$$

since the present value of consumption is given by $c_1 + \frac{c_2}{1+r}$, which must equal the person's income.

Consumer preferences are depicted below:



1. Suppose the interest rate is 0%. Then *5 points*

Current consumption is c_1 = . The person saves $.

2. Suppose the interest rate increases to 50%. Then *5 points*

Current consumption is c_1 = . The person saves $.

3. The change in saving due to the income effect is .

   he change in saving due to the substitution effect is .

   Explain briefly why raising the interest rate lowers savings (*Your answer must be brief, i.e., fit in the box below*). *5 points*

Question 4 Suppose there are two goods. The demand functions are given by

$$x_1(p_1, p_2, I) = \frac{I}{p_1 + \sqrt{p_1 p_2}}, \quad x_2(p_1, p_2, I) = \frac{I}{p_2 + \sqrt{p_1 p_2}}.$$

Suppose that originally income is $I = 84$ and $p_1 = 1$, $p_2 = 9$. Then the price of good 1 increases to $p_1 = 4$. *10 points*

Demand before the price change is $x_1 =$ $x_2 =$.

Demand after the price change is $x_1 =$ $x_2 =$.

The income effect is $\Delta^I x_1 =$ $\Delta^I x_2 =$.

The substitution effect is $\Delta^s x_1 =$ $\Delta^s x_2 =$.

(*We use the Slutzky income and substitution effect. To determine the substitution effect, we give the person just enough money such that the person can afford the original consumption.*)

Question 5 Suppose a lottery has the following payoffs. With probability 0.3 you win 4 Dollars, with probability 0.2 you win 10 Dollars, and with probability 0.1 you win 100 Dollars. With the remaining probability you win 1 Dollar. The Bernoulli utility function is $u(x) = -1/x$. *10 points*

The expected payoff of the lottery is .

The expected utility of the lottery is .

The certainty equivalent of the lottery is .

Question 6 A person has 10,000 Dollars, but faces a loss of 5,000 Dollars with probability 0.2. The person's Bernoulli utility is $u(x) = -1/x$. Determine the maximum amount the person is willing to pay to get insurance with full coverage. *10 points*

The person is willing to pay at most \$.

(*You must find the amount p at which the person is indifferent between being insured and being uninsured*.)

Question 7 Suppose there are three types of people *A*, *B*, and *C* in a population of 1 Million. Type *A* people have a probability of 0.01 of becoming seriously ill. For type *B* the probability is 0.2, and for type *C* it is 0.9. The medical costs from being treated for the illness is \$20,000. The maximum willingness to pay for insurance is \$300 for type *A*, \$6,000 for type *B*, and \$18,200 for type *C*. Also, assume that 90% of the population are type *A*, 8% are type *B* and 2% are type *C*. The type is private information, i.e., only each person knows their true probability of becoming ill, but not the insurance company. The insurance firm has an additional cost of 6 Million Dollars if it provides health insurance — these costs are not present if no insurance is provided.

(a) Suppose that insurance is mandatory (everyone must be insured). Because of government regulation the firm must provide insurance at a premium such that profits are exactly zero. Then *5 points*

The insurance premium is

(b) Now suppose that insurance is voluntary. *10 points*

If the insurance premium is \$300, then the firm's total profit is

Million Dollars.

If the insurance premium is \$6,000, then the firm's total profit is

Million Dollars.

If the insurance premium is \$18,200, then the firm's total profit is

Million Dollars.

If the insurance firm maximizes profits (and an option is always to not offer insurance in which case profits are zero). Then

% of the population will be insured by the firm.

Question 8 (*Difficult*) A person has 2,000 Dollars to invest. There are two investments, A and B, whose payoffs depends on the realized state of the economy. Suppose there are to states, denoted by ω_1 and ω_2, that each occur with probability 0.5. If the person invests x_A Dollars in A then he will receive $0.2x_A$ Dollars in state ω_1 and $2x_A$ Dollars in state ω_2. If the person invests x_B Dollars in B then he will receive $1.8x_B$ Dollars in state ω_1 and zero Dollars in state ω_2.

Suppose that all money must be invested, i.e., $x_A + x_B = 2,000$. The person's Bernoulli utility function is $\ln(x)$. Thus, the person solves the following optimization problem. *10 points*

The optimal investment amounts are $x_A =$, $x_B =$.