Princeton University	
Exam:	**Midterm, November 1999**
The course:	**Econ 501**
The lecturer:	**Ariel Rubinstein**
Length:	**4 hours**
Instruction:	**Answer all questions. Each problem has also a *** part which is more difficult. Write to the point! You can allow using any written material you wish to use.**

Problem 1: Consider the following preference relation on the space of lotteries L(Z): The decision maker has an ordering over Z and the lottery p is weakly preferred to q if the "best most likely prize in the support p" is as good as "the best most likely prize in the support of q".

* Is this a preference relation?
* Does it satisfy vNM Independence and Continuity axioms?

*** The preference has a "framing problem": The question whether a prize "a flight to Hawaii" is presented in the model as one prize or as two prizes--- "a flight to Hawaii leaving on 12:10" and "a flight to Hawaii leaving on 12:11"--- may matter. Explain, and show that the expected utility method does not suffer from this type of "problem".

Problem 2: A consumer "lives" in a world with two commodities, 1 and 2. Assume that his preferences satisfy monotonicity, continuity and convexity. The price of commodity 2 is fixed in the level of 1 units of wealth. Let us also fix the consumer's wealth, w. As to commodity 1, the consumer pays for each unit a price which is decreasing in the quantity of commodity 1 that he purchases. In other words, the expense of purchasing x_1 units of commodity 1 (in wealth terms), $f(x_1)$, is increasing, concave function of x_1 with $f(0)=0$.

* Define the consumer's problem.
* Characterize the optimal solution.

***The indirect utility function V(f) gets in its domain <u>a price schedule</u> (the <u>function</u> f) and not a single price as was the case when the price is fixed). State and prove the analogous result to the Roy's equality.

<u>"Hint"</u>: Consider the case that commodity 1 is sold in "discrete" quantities, 0,1,2,3,… and consider the function: V(f(1), f(2)-f(1), f(3)-f(2),…..,)

Problem 3: The set of flowers in the world, is classified according to more primitive equivalence relations, like "number of leaves", "color", "season of blooming" etc. The classification system is an example of a process of constructing an equivalence relation on the basis of n more primitive equivalence relations.

Let a classification method (CM) on a set X (containing at least 3 alternatives) be a function which assigns an equivalence relation on X to every n-tuple of equivalence relations.

We will say that a CM satisfies the consensus axiom if whenever the n relations find an element a to be equivalent to b so does the CM and whenever all relations find the two elements non-equivalent, the CM finds them non-equivalent as well.

We will say that an CM satisfies independence axiom if for every $a,b,c,d \in X$ and any two profiles of equivalence relations $(I_i)_{i=1,..,n}$ and $(I'_i)_{i=1,..,n}$ if
aI_ib iff cI'_id for all i, then
the CM finds a equivalent to b in $(I_i)_{i=1,..,n}$ iff it finds c and d equivalent in $(I'_i)_{i=1,..,n}$.

* Find a CM satisfying the two axioms.

* Find a CM, which satisfies Independence but not the Consensus axiom, and a method, which satisfies Consensus but not Independence.

* Consider a method which finds x equivalent to y if the majority of relations find x equivalent to y. Why this method is not a good example of a CM satisfying the two axioms?

*** And… if you really have a surplus of time… Characterize the set of all CM's satisfying the above two axioms.

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