## **PROBLEM SET 5: MIDTERM REVIEW QUESTIONS**

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Questions marked  $(\mathbf{T}, \mathbf{F}, \mathbf{U})$  should be answered "True," "False," or "Uncertain," and your answer should be briefly justified. Note that points will be awarded based only on your reasoning, not on the answer itself, even if correct.

- (1) (**T**,**F**,**U**) If all income elasticities are equal then even for <u>uncompensated</u> demands we have  $\partial x_i / \partial p_i = \partial x_j / \partial p_i$ .
- (2) Picture yourself in a world with only two goods, love and money. What can you say about the Beatles' indirect utility function?
- (3) (**T**,**F**,**U**) An increase in a smoker's income may lower their health even if health is a normal good.
- (4) (**T**,**F**,**U**) A consumer's demand curve for a good generally will shift if the prices of other commodities change.
- (5) (**T**,**F**,**U**) Suppose that a football fan receives utility when her team wins, and disutility when her team loses. Then before the season begins she should choose the team with the highest probability of winning.
- (6) (T,F,U) Suppose that at an initial cost of \$1000, a homeowner can insulate his house and save \$50 each year in heating bills. If the interest rates are 6%, should the houseowner insulate or not?
- (7) (**T**,**F**,**U**) If there are only two consumers in a market, the market demand is more inelastic with respect to the own price (market price) than the corresponding individual demands at any price level.
- (8) (**T**,**F**,**U**) Marshallian demand curves always slope downwards.
- (9) (**T**,**F**,**U**) In response to a new pollution regulation, the price of gasoline goes up and the government must compensate consumers \$200 to avoid a loss in their utility. This is the same amount that consumer's would have been willing to pay to avoid the price change in the first place.
- (10) (**T**,**F**,**U**) Consider an economy with only two goods, beans and rice. If the price of both double then compensated demand for each good will fall by an equal amount.

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- (11) (T,F,U) Consider an economy with only two goods, wine and beer. For a person with income Y who isn't fond of alcohol (but who nonetheless prefers more to less), both goods may be inferior.
- (12) (**T,F,U**) Suppose that a person has a utility function U(C, L) where C is an inferior good and where L is leisure. Time worked is (1 L), and the person earns a wage of w for every hour she works. *Holding utility constant*, an increase in the wage may lead to a decrease in consumption of C, since an increase in income may lead the person to take more leisure.
- (13) (**T,F,U**) The utility function U(x) = -1/x doesn't yield a valid set of demands; since it's negative, it violates the axiom of nonsatiation.
- (14) (**T**,**F**,**U**) If income elasticities are equal for all goods, then all Marshallian demand functions must be downward sloping.
- (15) For consumer behavior, we normally assume the following properties:
  - a) Transitivity
  - b) Non-satiation (more is better)
  - c) Differentiability
  - d) Completeness
  - e) Quasi-concavity

For each of the indifference maps shown below, indicate which assumptions about behaviour are violated. (Some maps may violate more than one assumption.) Briefly justify your answer. (16) In 1998 the City of Berkeley proposed increasing taxes in order to provide better access and services to local parks and nature areas.

Suppose that Berkeleyans care about parks/nature areas (N) and about "other goods" (Z); furthermore, assume that preferences over other goods are such that the conditions of the composite commodity theorem are satisfied.

Also suppose that the city—having noticed how much you've learned in EEP 100—could have hired you as a consultant to help decide how much N the city ought to provide for its citizens. The city mothers and fathers' sole aim is to make Berkeleyans as happy as possible, given limited city resources (all of which ultimately come from taxpayers).

- a) Briefly discuss what practical steps you'd take to solve this problem. What data would you collect, why would you collect it, and (especially) how would you collect it?
- b) How might the composite commodity theorem help you in formulating your answer to ???
- c) Suppose all Berkeleyans have utility of N and Z defined by

$$U(N,Z) = \log N + \frac{1}{2}\log Z,$$

the cost of providing one unit of N is \$100,000, and the price of Z is one. How much N would *each* Berkeleyan prefer, as a function of income, if s/he had to provide it his or herself, rather than relying on the city? Assume (just for this part) no sharing among residents.

- d) One nice thing about parks is that people can share them; that is, by providing N units of parks, every Berkeleyan can consume N. If every Berkeley resident has an income of \$1000, and there are a total of 100,000 Berkeleyans, then how much N should the city provide?
- e) Now suppose that there are actually two types of Berkeley residents. There are 50,001 "normal" residents, and 49,999 "students." There is no overlap between the two groups. The only difference between the two groups is that normal residents have the preferences given in ??, while students have preferences given by

$$U(N,Z) = \left[N\sqrt{Z} + \cos\left(e^{\pi\sqrt{-1}}\right)\right]^{42!} / \sum_{j=0}^{\infty} \left(\frac{665}{666}\right)^j$$

How much N should the city provide?

- f) Now suppose that there's a second difference between Berkeley types: students have an income of \$1000, while normal people have an income of \$50,000. If the city finances N by charging all residents the same amount in taxes, then how much N would students prefer? How much would normal people prefer?
- (17) Suppose that a typical poor household in the U.S. spends \$10,080 on either food (F) or clothing (C). Moreover, this typical household's utility is given by  $U(F, C) = F^2C$ . The market price of food is \$10 per unit, while the price of clothing is \$1 per unit.
  - a) Show that the utility function is quasiconcave, but *not* concave.
  - b) How much of this household's income will be spent on food?
  - c) The federal government decides to increase poor households' level of utility by subsidizing food. If the government allows poor households to purchase food at half the market price (the other half being paid by the government), how many more units of food will be purchased?
  - d) How much of the increase in food purchases will be due to an income effect?
  - e) How much will this program cost the government per participating household?
  - f) The government could also increase the household's utility to the same level by giving them additional income directly. How large a cash transfer would be required to do this, in the absence of a food subsidy?
  - g) How do the costs of the cash transfer program compare to the costs of the food subsidy program?
- (18) The U.S. Pacific Northwest is a region rich in water resources. Dams are built on many rivers to provide inexpensive hydroelectric power to many communities. Unfortunately, dams also become an almost impenetrable barrier to the adult salmon, which need to migrate upstream to procreate. In recent years, the salmon population has been declining. Let's assume that in a particular community in the Pacific Northwest there are only two goods being consumed, electricity  $(q_1)$  and other goods  $(q_2)$ . The current budget is equal to \$72, the current price of electricity is  $p_1 = 9$  and the current price of the other goods is  $p_2 = 1$ . This community is considering the construction of a new dam in one of its principal rivers. It has been estimated that the increased supply of electricity will reduce the price of electricity to  $p_1 = 1$ . Unfortunately, however, the existing population

of salmon will die. Let's assume that the community has the following utility function

$$U(q_1, q_2) = 4\sqrt{q_1q_2}$$

- a) In order to keep the local people from building the dam, the government is considering compensating them in lump sum. How much does the government have to offer?
- b) Once the dam is built, how much are local people willing to spend on lobbying in order to prevent the dam being torn down as proposed by an environmental group?Let us assume that the salmon is too valuable so that the dam won't be built. The government decides to subsidize consumers \$5 for each unit of electricity consumed.
- c) How much does the subsidy cost the government?
- d) How much is the dead weight loss from this policy?
- (19) Akerlof's demand for tomato is:

$$D = 12 - 3P.$$

McFadden's demand for tomato is:

$$D = 16 - 4P$$
.

Legion's demand for tomato is:

D = 20 - 5P.

Where D is the pounds of tomato, P is the price of tomato per pound.

- a) If Akerlof, McFadden and Ligon are the only people living in the Republic of Berkeley, what is the total market demand for tomato? Give the equation and graph the total demand curve.
- b) Berkeley's neighbor, Stanford, always grows more tomato than it can consume. Since the weather is extremely good, the cost for Stanford to grow tomato is zero. Stanford always shares tomato with Berkeley guys, allowing them to take as many tomatoes as they want for free. However, for some reasons Stanford decides to charge Berkeley guys 1 dollar on each pound of tomato from next year.
  - (i) How will Berkeley's social surplus change next year compared to before?
  - (ii) How much will Stanford gain in revenue from the charge next year?
  - (iii) What is the deadweight loss next year?