

PROBLEM SET 9

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Questions marked (T,F,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 your perfume has negative externalities on your partner (he is allergic to the scent), then you are consuming more perfume than Pareto optimal level.
- (2) (T,F,U) Optimality requires eliminating all the negative externalities.
- (3) On the island of Pago Pago there are 2 lakes and 20 anglers. Each angler can fish on either lake and keep the average catch on his particular lake. On Lake X the total number of fish caught is given by

$$F^X = 8L_X - \frac{1}{3}L_X^2$$

where L_X is the number of people fishing on the lake. For Lake Y the relationship is

$$F^Y = 4L_Y$$

- a) Under this organization of society, what will be the total number of fish caught?
 - b) The chief of Pago Pago, having once read an economics book, believes that it is possible to raise the total number of fish caught by restricting the number of people allowed to fish on Lake X. What number should be allowed to fish on lake X in order to maximize the total catch of fish? What is the number of fish caught in this situation?
 - c) Being basically opposed to coercion, the chief decides to require a fishing license for Lake X. If the licensing procedure is to bring about the optimal allocation of labor, what should the cost of a license be (in terms of fish)?
- (4) A municipality is considering setting aside some of its undeveloped land as a wilderness reserve. There are 1000 households

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in this municipality and all of them will derive utility from the use and existence of this reserve. The amount of utility derived depends on the size of the reserve. (In this problem, households have uniform preferences and budget constraints.) Utility for each household is given by:

$$U(X, Y) = 2xy.^8$$

where x is the size of the reserve and y is households' consumption of other goods. (P_y is normalized to 1). The reserve will be paid for by a lump sum tax paid by each household to the government and the cost of the reserve is $10x$, where x is measured in hectares. The reserve is non-rival and non-excludable.

- a) What is the optimal size of the reserve?
- b) How much y is consumed by each household?
- c) What is the amount of the lump sum tax paid by each household when the optimally-sized reserve is established?
The alternate use of the land is commercial development and the return to commercial development is R per unit of land, x .
- d) What is the opportunity cost of establishing a reserve of the size calculated in part a?