

HOMework 2

ECON 661

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Problem 1. (20 points) Suppose ten people each have the demand $Q = 20 - 4P$ for streetlights, and ten people each have the demand $Q = 8 - P$ for streetlights. The marginal cost of providing the public good is constant at \$6. What is the socially optimal level of production and how is it determined? How many streetlights will be produced?

Problem 2. (30 points) The town of Springfield has two residents: Homer and Bart. The town currently funds its fire department solely from the individual contributions of these residents. Each of the two residents has a utility function over private goods (X) and total fire fighters (G), of the form $U = 4\ln(X) + 2\ln(G)$. The total provision of fire fighters hired, G , is the sum of the number hired by each of the two persons: $G = G_H + G_B$. Homer and Bart both have income of \$100, and the price of both the private good and a fire fighter is \$1. Thus, they are limited to providing between 0 and 100 fire fighters.

2.A How many fire fighters are hired if the government does not intervene? How many are paid for by Homer? By Bart?

2.B What is the socially optimal number of firemen? If your answer differs from 2.A, why?

Problem 3. (30 points) Suppose there are only two individuals in society. The demand curve (willingness to pay) for mosquito control for person A is given by $P = 100 - Q$, and the demand curve for person B is given by $P = 200 - Q$.

3.A Suppose that mosquito control is a pure public good; that is, once produced, everyone benefits from it. What would be the optimal level of this activity if it could be produced at a constant marginal cost of \$120 per unit?

3.B If mosquito control were left to the private market, how much might be produced?

3.C If the government were to produce the optimal amount of mosquito control, how much will this

cost? How should the tax bill for this amount be allocated between the two individuals if they are to share it in proportion to benefits received from mosquito control?

Problem 4. (25 points) A beekeeper lives adjacent to an apple orchard. The orchard owner benefits from the bees because each hive impollinates about one acre of apple trees. The orchard owner pays nothing for this service, however, because the bees come to the orchard without his having to do anything. There are not enough bees to pollinate the entire orchard, and the orchard owner must complete the pollination by artificial means, at a cost of \$10 per acre of trees.

Beekeeping has a marginal cost $MC = 10 + 2Q$, where Q is the number of bee hives. Each hive yields \$20 worth of honey.

4.A How many beehives will the beekeeper maintain?

4.B Is this the economically efficient number of beehives? If not, what would be the efficient number?

4.C What changes and/or policies would lead to the more efficient operation?