

1. (1 point each) Please do problems 3 and 4 from Chapter 10 in your text.

2. (1 point) True, false, or true under certain conditions but false under others? In any case explain!

a) In Eden, Eve does the fishing and Adam makes the clothes – they then barter clothes for fish. Adam dumps dye into the lake, which lowers Eve's fishing yield. There is no need for a higher power to intervene to address Adam's negative externality on Eve.

b) There is no reason for state or federal subsidization of education, since people who live in areas with low educational spending prefer low taxes over high education spending.

3. (3 points) Your utility function is given by  $U = \log(2C)$ , where  $C$  is consumption. You make \$50,000 per year but face a risk of illness. There's a 10 percent chance that in the next year you will become ill and incur medical costs of \$30,000. What is your expected utility without insurance? Suppose you can buy insurance that charges you a premium no matter what happens and then will cover your medical expenses should you fall ill. What is the actuarially fair price for such a policy? What is your expected utility if you buy it? What is the most you would be willing to pay for the policy?

4. (4 points) The superhero profession is a dangerous business. Every year, in fact, there's a probability  $p$  that a given superhero will be caught by a ruthless supervillain, who inflicts damage that requires \$50 in medical costs to heal. Being a superhero doesn't pay well, but fortunately, superheroes receive an annual income of \$100 from their (covert) civilian job. They first spend money on any medical costs, and use the rest for consumption.

In one particular metropolis, there are two types of superheroes: clumsy and skillful. Clumsy superheroes have a 90% probability of being caught by a supervillain and suffering \$50 in medical costs. Skillful superheroes, on the other hand, are only caught with probability 30%. Additionally, these two types have different utility functions. The utility of consumption for clumsy superheroes is  $U_{clumsy} = (C_{clumsy})^7$  while the utility of consumption for skillful superheroes is  $U_{skillful} = (C_{skillful})^5$ . Fortunately for this metropolis, there are eleven times as many skillful superheroes as clumsy superheroes.

ACME Insurance Company has moved in to the city, and is thinking about offering health insurance to superheroes.

- a) If ACME can perfectly identify whether each superhero is skillful or clumsy, then it can charge a different premium to each type. Suppose it charges an actuarially fair price for insurance. How much will ACME charge each type for full medical coverage? Will each type buy coverage? How much will each type have for consumption if they get caught? How much will they have if they don't get caught?
- b) Now suppose that the type of the superhero is unobservable by the insurance company (although the superheroes themselves know), so ACME can only offer a single price for insurance.

- (i) What is the maximum amount of money each type will pay in order to be fully insured against medical costs? Explain why this amount is the same or is different from the costs of actuarially fair insurance.
  - (ii) Given this, what is the maximum amount that ACME can charge such that *all* types will fully insure? Will ACME stay in business if it does this? Is there a market failure in the insurance market – why or why not?
- c) ACME instead considers offering two types of insurance coverage. The “minimal coverage” plan provides \$20 in insurance coverage for total costs of \$7. The “extensive coverage” plan offers \$50 in insurance for total costs of \$34. Which of these plans, if any, will each choose? Will ACME stay in business? Now is there a failure in the insurance market? Why or why not?
- d) Dr. Brain (a mad scientist) develops a new blood test that flawlessly identifies whether a superhero is clumsy or skillful, so that everyone (including insurance companies) will then be able to identify his or her type. However, this test is not free: the test costs \$1.50 to administer to a superhero. Suppose Dr. Brain offers to perform this procedure on any superhero who is willing to pay \$1.50.
- (i) Assuming that there is perfect competition in the insurance market, and that once a test is undertaken all insurance companies know the superhero’s type. Will any type be willing to purchase the test? Why or why not? To answer this, think about what will happen in the insurance market in response, i.e., will a single price be offered or will different prices be offered depending on who takes the test – and what will be the equilibrium prices?
  - (ii) Relative to c), which type is better off now that it is possible to reveal types – or are both better off?
  - (iii) Now is there a failure in the insurance market?