

Economics 441 Midterm

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True, false, uncertain; explain. (9 points each) State whether each of the following statements is true, false or uncertain (by which we mean the answer is ambiguous, under some circumstances it may be true and under others it may be false), and explain your answer. If a word or phrase is underlined, you must provide its definition in your answer.

1. In Metropolis, there are two types of superheroes: clumsy and skillful. All superheroes earn \$100 incomes. 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 30% probability. Every superhero has a utility of dollars D of $U(D) = 5D$. There are 11 times as many skillful as clumsy superheroes.

Insurance company PoolCo cannot tell whether a superhero is clumsy. There is no insurance contract that PoolCo can sell to all Metropolis superheroes without making losses.

2. [Fact] Table 9.3 in your text demonstrates that, among 30 industrialized nations, the U.S. has the highest per capita medical expenditures, the 23rd highest life expectancy at birth, and the 3rd highest infant mortality rate. [True/false/uncertain & explain] U.S. medical expenditures, therefore, are yielding very small returns.

3. The point of the Second Fundamental Theorem of Welfare Economics is that unfettered markets allocate goods fairly.

4. [Fact] At the start of fiscal year 2005, the U.S. federal government debt was \$4.3 trillion (\$4300 billion). During 2005 inflation was 3.4%. [True/false/uncertain & explain] Thus the inflation tax contributed \$146.2 billion to 2005 federal revenues.

5. At the efficient allocation of a pure private good, the MRS between that good and the relevant alternative is the same for all consumers of the good AND all consumers of the good consume the same amount.

6. In an economy with only one commodity, two people and no production, any possible allocation is Pareto efficient.

Essays

1. (23 points) In an economics laboratory experiment each subject is given \$10. Subjects decide how much of the \$10 to keep and how much to contribute to the group. Contributed dollars are multiplied by x before being added to common pot. The pot is then divided perfectly evenly across all 14 subjects.

Subjects' contributions are completely unobservable to everyone else. Subjects care only about their own payoffs from the experiment.

(a) At what value(s) of x does it pay a subject more, no matter what the other subjects do, to give \$1 to the common pot than to keep \$1? Assuming such x value(s), what is the maximum possible amount each subject can possibly take home? What actions lead to this outcome?

(b) At what value(s) of x could perfect cooperation among subjects increase each subject's payoff from the experiment? Why? Assuming such x value(s), what is the maximum possible amount each subject can possibly take home? What actions lead to this outcome? What is the minimum possible amount each subject can possibly take home? What actions lead to this outcome? What would a rational individual payoff-maximizer choose to do?

(c) At what value(s) of x is cooperation irrelevant? Explain.

(d) What is the purpose of the experiment? What x values make for the most interesting experiment, and why?

2. (23 points) The social cost of pollution in Whoville is a constant \$125 per emissions unit. The two factories polluting Whoville with their emissions from production are Nu's aluminum factory and Auld's smelting. Nu's costs of abating e units of emissions are $C_N(e) = \frac{25}{2}e^2$. Auld's costs of abating e units of emissions are $C_A(e) = \frac{5}{3}e^3$.

(a) What is the marginal benefit of a unit of pollution abatement? What function expresses the marginal cost of abatement level e for Nu's? What function expresses the marginal cost of abatement level e for Auld's? Depict this situation in a graph or set of graphs.

(b) What is the socially optimal abatement level for Nu's? for Auld's? Indicate these levels on your graph(s).

(c) Suppose the governor of Whoville knows Nu's and Auld's abatement cost functions and mandates that each firm set the socially efficient level of abatement. Is this fair?

(d) Suppose instead that the governor of Whoville does not know the firms' cost functions. Instead she offers a per-unit subsidy for emissions abatement of \$125. What levels of emissions abatement do Nu's and Auld's choose? Are they socially efficient? Depict the resulting subsidies paid to Nu's and Auld's on your graph(s).

(e) Finally, suppose instead that the government gives 10 emissions permits, each valid for 1 units' worth of emissions, to Nu's. Permits are fully transferable. With zero abatement both Nu's and Auld's each pollute 10 units' worth of emissions. What is Nu's benefit from the 10th permit? Indicate this on your graph. What would Auld's be willing to pay for a first permit? Indicate this on your graph. What do you expect to transpire? Is the result socially efficient?