

time : 60 minutes

Do all 3 questions. All count equally.

1. If the cost of producing one unit of a pure public good is \$1, and the cost of producing one unit of a pure private good is \$1, what are the efficient allocations in an economy with 1000 people, if each person's preferences can be represented by the utility function

$$U(x, z) = x + \ln z$$

where x is the person's private good consumption, and z is her public good consumption (and "ln" represents the natural logarithm), if the total income in the economy (available in total for public and private good provision) is \$3000?

2. How much tax revenue would be collected by the following "pivot tax" mechanism, if each person tries to use the mechanism to make herself as well off as possible?

The indivisible ("all or nothing") public project costs \$1000. There are 4 people : each person knows how much she values the project (but nobody else knows her valuation). Person #1 values the project at \$600, person #2 values it at \$200, person #3 values the project at \$200, and person #4 values it at \$200.

The rules of the tax are : the project will be undertaken if and only if the sum of people's announced valuations exceeds the cost of the project, \$1000. If the project is undertaken, each person will pay the same share, \$250, of the cost. In addition, if any person is "pivotal" (that is, if her valuation alters the overall result), then she will have to pay a pivot tax, equal to the (absolute value of the) difference between the sum of everyone else's announced valuations and the sum of the shares of the cost (750) which they must pay.

3. If firm #1 uses flour as an input to production, and if firm #2's output is a decreasing function of firm #1's flour usage (since flour particles clog up firm #2's machinery), give **three** different remedies which ensure that firm #1 chooses its quantity of flour efficiently.