Problem Set #6
PAI 897
Professor David Popp
Fall 2023

Solutions Available Wednesday, December 6

1. The population of Utopia consists of five groups of people with different incomes. The table below shows the current income distribution for the city of Utopia. Concerned about the level of inequality, city leaders are debating three policies to redistribute income. The income distribution that results from each policy is shown in the rows below the current distribution.

	Income Group A	Income Group B	Income Group C	Income Group D	Income Group E	Total Income
Current income	$100	$90	$50	$30	$20	$290
Policy 1	$85	$80	$50	$40	$30	$285
Policy 2	$40	$40	$40	$40	$40	$200
Policy 3	$60	$60	$60	$40	$30	$250

    a) Which policy, if any, would a policy maker using a Rawlsian social welfare criterion support? Why?
    b) Which policy, if any, would a policy maker using a utilitarian social welfare criterion likely support? Why?
    c) Are any of the proposed policies Pareto improvements? Why or why not?

2. Some national parks do not charge entrance fees during the winter, except on weekends. Is this an efficient pricing policy?

3. Three neighbors – Tyrone, Tasha, and Pablo – will be voting on expansion of a neighborhood park. The expansion will cost $6,000. All three will share the cost of the expansion – that is, each person will contribute $2,000 to the installation. The expansion is worth $2,500 to Tyrone, $2,250 to Tasha, and $1,000 to Pablo.
    a) Explain why the park expansion is a public good.
    b) Is the proposed park expansion efficient? Why or why not?
    c) Suppose a majority rule vote is held to determine whether the expansion should take place. What will the result of the vote be? Explain any differences between this result and your answer in part (b).

4. Golf balls are hand crafted by artisans in Scotland. Demand for golf balls can be represented by the curve P = 105-2Q, where Q represents boxes of golf balls. The marginal cost per box of golf balls equals 0.5Q. However, to produce dimples on golf balls, the artisans must chip away at the surface of the balls, creating small waste particles that pollute the local environment. The damage done to the local environmental is given by the following marginal damage curve: MD = Q.

    a) Assume that the market for golf balls is perfectly competitive. How many boxes of golf balls will be produced if nothing is done to regulate the pollution? At what price will they be sold? Use a graph to illustrate your answer.

    b) What is the socially efficient level of golf ball production? What should the price be? Use a graph to illustrate your answer.

    c) To bring about the level of production you found in part (b), the government proposes using a Pigouvian tax. At what level should they set the tax? How do you know this?

5. Amid rising concerns about pollution in Beaver Lake, regulators are considering new rules that would limit the amount of liquid wastewater released from two factories along the lake. Below are estimates of the marginal costs of abatement for each gallon of wastewater reduced by each firm:

Abatement (in gallons)	Woody's Woodworking	Custom Built Dams
1	$2	$6
2	$4	$12
3	$6	$18
4	$8	$24
5	$10	$30
6	$12	$36
7	$14	$42
8	$16	$48
9	$18	$54
10	$20	$60
11	$22	$66
12	$24	$72

    a) The first proposed regulation would require each firm to reduce the gallons of wastewater they put into the lake by 6 gallons. What is the total cost of abatement for Woody's Woodworking? For Custom Built Dams? What is the combined total for both firms?

    b) Suppose instead that the government uses an emissions fee of $18.25 per gallon. How many tons will Woody's Woodworking clean-up when faced with this fee? How many tons will Custom Built Dams clean up? Please explain how you found your answer.

    c) Calculate the total cost of abatement for each firm. How do the combined total costs of abatement for both firms compare to part (a)? Explain, using concepts we discussed in class, how the emissions fee causes the changes you observe.

6. Consider the price of an automobile insurance policy that replaces the car in case it is destroyed in an accident. For simplicity, assume all cars are worth exactly $20,000 and all accidents require that the car be replaced. Also, assume there are just two types of drivers:

- Safe drivers, who have a have a 1% chance of being in an accident
- Speedsters, who have a have a 5% chance of being in an accident

a) If a driver is in an accident, the insurance policy will replace the vehicle with a new one of equal value. Given this, what is the actuarially fair price for an insurance policy that only covers safe drivers? That is, what is the expected value of the damages that safe drivers have?

b) What is the actuarially fair price for an insurance policy that only covers speedsters? That is, what is the expected value of the damages that speedsters have?

c) Suppose that one-half of all drivers are safe drivers, and the other half are speedsters. If the insurance company must offer a policy with the same price to all drivers, what would that price be? That is, what price covers the expected value of payouts to all drivers?

d) At this price, will safe drivers wish to buy insurance? Why or why not? What type of market failure does this illustrate?