Student name	Master	Grade
		/20

Instructions

- *No document allowed*

- *Calculators not allowed.*

- *Multiple choice questions:*

  - *Answers **must** be written in the table at the end of Part 1.*
  - *Grading for each question:*
    - *∗ No answer: 0 point*
    - *∗ Correct answer: 3 points*
    - *∗ **!!!!! Wrong answer: -1.5 points !!!!!***

- *Problem set:*

  - *Please read carefully, be brief and precise.*

- *Total number of marks: 9 for multiple choice questions and 11 for problem set*
  ⇒ Total = 20

PART 1. Multiple choice questions

1. The definition of a *public good* is a good that satisfies,
   - A. *rivalry* and *excludability*
   - B. *rivalry* and *non-excludability*
   - C. *non-rivalry* and *excludability*
   - D. *non-rivalry* and *non-excludability*

2. Let the *Egalitarian* social welfare function be defined as,
$$W(u_1, \ldots, u_N) = \sum_i u_i - \lambda \sum_i [u_i - \min_i(u_i)], \quad \lambda \geq 0$$

   This specification of the *Egalitarian* social welfare allows it to be transformed into,
   - A. the *Benthamite* (Utilitarian), **but not** the *Rawlsian* social welfare function
   - B. the *Rawlsian*, **but not** the *Benthamite* (Utilitarian) social welfare function
   - C. the *Benthamite* (Utilitarian) **and** the *Rawlsian* social welfare function
   - D. not any of the *Benthamite* (Utilitarian) or the *Rawlsian* social welfare functions

3. Based on the following figure, which of the following statements is not correct?
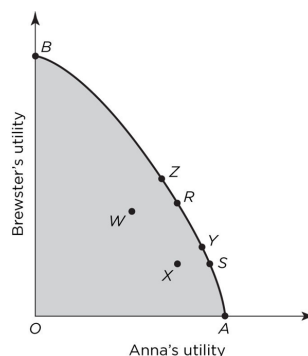
   - A. On Pareto grounds we cannot compare X and B.
   - B. On Pareto grounds we cannot compare X and Z.
   - C. On Pareto grounds we cannot compare X and Y.
   - D. On Pareto grounds we cannot compare X and W.

Question	**1**	**2**	**3**	
Answer				
Grade				/9

Note: Provide your answer (A, B, C, or D) in row *Answer*.
Leave row *Grade* empty.

PART 2. Problem set

Questions

The Fireyear and Goodstone Rubber Companies are two firms located in the rubber capital of the world. These factories produce finished rubber and sell that rubber into a highly competitive world market at the fixed price of \$60 per ton. The process of producing a ton of rubber also results in a ton of air pollution that affects the rubber capital of the world. This 1:1 relationship between rubber output and pollution is fixed and immutable at both factories. The total cost for Fireyear (Goodstone) from producing Q_F (Q_G) units of tires is $300 + 2Q_F^2$ ($500 + Q_G^2$). Total pollution emissions generated are $E_F + E_G = Q_F + Q_G$. Marginal damage from pollution is equal to \$12 per ton of pollution.

(a) In the absence of regulation, how much rubber would be produced by each firm? What is the profit for each firm?

(b) The local government decides to impose a Pigouvian tax on pollution in the community. What is the proper amount of such a tax per unit of emission? What are the post-regulation levels of rubber output and profits for each firm?

(c) Suppose instead of the emission tax, the government observes the outcome in part (a) and decides to offer a subsidy to each firm for each unit of pollution abated. What is the efficient per unit amount of such a subsidy? Again calculate the levels of output and profit for each firm.

d) Compare the output and profits for the two firms in parts (a) through (c). Comment on the differences, if any, and the possibility of one or both of the firms dropping out the market.

Answers

(a)

(b)

(c)

(d)