

**Econ 325: Environmental and Natural Resource Economics**  
**Fall 2007**  
**Problem Set 2**

Due in class: Tuesday October 2, 2007

Instructions: Answer all 6 questions. Feel free to use Microsoft Excel wherever necessary. Please show your work, and be sure to label all graphs accordingly.

1. Within a market, since demand is assumed to reflect private benefits and supply reflects private costs, equilibrium reflects maximizing net private benefits. When does this equilibrium also reflect maximizing social benefits?

When does it NOT reflect maximizing social benefits?

In the cases where it does not, elucidate the problem.

2. Below are portions of the demand curves of three individuals for the water quality in Lake Union. The water quality is expressed in terms of the parts per million (ppm) of dissolved oxygen (DO). Water quality improves at higher DO levels. The demand curve shows the desired water quality of each individual in relation to the marginal costs of water quality improvements (the MC of raising the DO level in the lake).

MC of raising DO level (dollars per ppm)	Desired DO level (ppm)		
	A	B	C
10	0	0	1
8	0	1	2
6	1	2	3
4	2	3	4
2	3	4	5
0	4	5	6

- A. Graph the market willingness to pay curve for these three people. *Hint: water quality is a public good!*

- B. If the actual MC of increasing DO is \$12, what is the socially efficient level of DO in the lake, assuming these three people are the only ones involved?

3. Define and explain. Illustrate graphically and/or give examples where appropriate.

A. Marginal benefit

B. Public Goods

C. Pecuniary externality

D. Dynamic efficiency

E. Present value of net benefits

4. Assume that the demand curve for the threatened but delicious sea bass is fully coincidental with the marginal social benefit function and can be described as  $MSB = MPB = 24 - 2q$ , where  $q$  refers to the quantity of the good. Assume that the marginal private cost function can be described by  $MPC = q$ , and that marginal social costs are always double the marginal private cost.

A. Determine an equation for the marginal social costs (MSC).

B. Graph the functions and algebraically determine

i. the market level of output

ii. the optimal level of output

C. Calculate the social welfare at the market level of output, at the optimal level of output. What is the deadweight loss from these social costs?

5. A.C. Pigou was among the first to recognize the existence of externalities. Illustrate and discuss Pigou's approach to correcting market externalities.

6. Consider a crowded room with an equal number of smokers and non-smokers. Each smoker would be willing to pay \$1.00 to have the right to smoke. Each non-smoker would be willing to pay \$0.50 to have the room free from smoke. Assume there is a rule that says no smoking is allowed. Could everyone be made better off if smoking is allowed? How? If property rights to clean air are assigned to the non-smokers, how might the efficient outcome be attained? What difference does it make to the outcome whether there is initially a rule that smoking is allowed or smoking is not allowed? What problems might you envision occurring if no smoking is allowed unless all the non-smokers agree to allow smoking?