

**AAE / Econ / Env. St. 343
Environmental Economics**

**Homework #1
Suggested Answers**

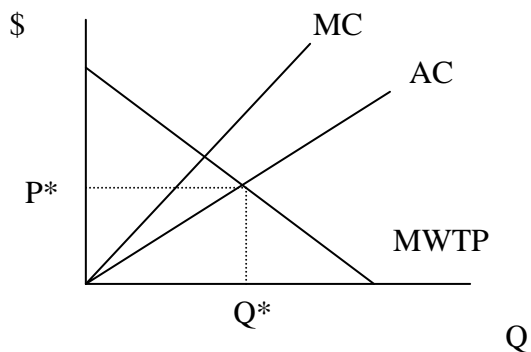
Please read the two newspaper articles available on the course website on 1) wind power in Cape Cod, and 2) United States land trusts. Next, provide short answers to the following 8 questions.

The following table applies to questions 1 and 2. Suppose a community's TOTAL WILLINGNESS TO PAY for groundwater and the local utility's TOTAL COST of producing water is given by:

Quantity (# of units produced)	Total Willingness to Pay (\$)	Total Costs (\$)	Marginal Willingness to Pay (\$)	Marginal Costs (\$)	Average Costs \$
0	\$0	\$0	-	-	-
1	\$24	\$11	24	11	11
2	\$46	\$24	22	13	12
3	\$65	\$38	19	14	12.7
4	\$82	\$54	17	16	13.5
5	\$97	\$72	15	18	14.4
6	\$110	\$92	13	20	15.3
7	\$121	\$114	11	22	16.3
8	\$130	\$138	9	24	17.3

1. Many water utilities in the United States use the **average cost** of producing water to set their price. For example, if the average cost of producing 2 units of water equals \$12 / unit, then \$12 / unit is the price the utility charges. How many units will the utility produce if they follow average-cost pricing? Graphically depict this outcome using continuous supply and demand graphs.

Answer: If they follow average cost pricing they will produce 5 units (that's where MWTP equals AC).



2. Will the average-cost pricing scheme presented above result in an **efficient** allocation of groundwater? Show your work.

Answer: No, the efficient allocation of groundwater is where MC equals MWTP (4 units).

3. Suppose a clean lake is considered a public good for residents, and two lakeshore residents are interested in reducing water pollution into their lake. The TOTAL WILLINGNESS TO PAY for reducing water pollution is as follows:

<u>Units of Pollution Reduced</u>	<u>Total Willingness to Pay (citizen A)</u>	<u>Total Willingness to Pay (citizen B)</u>	<u>Marginal Willingness to Pay (Citizen A)</u>	<u>Marginal Willingness to Pay (Citizen B)</u>
1	\$15	\$5	\$15	\$5
2	\$25	\$7	\$10	\$2
3	\$30	\$8	\$5	\$1

If the cost of pollution reduction is \$11 per unit, how much pollution will be voluntarily cleaned up (i.e. the free market solution)? What is the efficient amount of pollution to clean up?

Answer: The benefits received from a clean lake are non-excludable since the lake is a public good. Therefore, only one unit of pollution will likely be cleaned up because $MWTP_A$ (\$15) exceeds the cost of reducing the first unit (\$11), so citizen A has a private incentive to clean the first unit by themselves – Citizen B has no private incentive to contribute to cleaning the first unit since benefits are non-excludable. However, it would be efficient to clean up the second unit as well, since $MWTP_A + MWTP_B = \$12$, which exceeds the cost of \$11. But, since neither citizen has a private incentive to clean up the second unit, and given the incentive to free-ride, the second unit is unlikely to be cleaned up.

Note on grading: the key thing to address in this question is the fact that the lake is a public good, and so there is incentive to free-ride.

Questions 4-5 refer to reading #1.

4. What is likely the main reason for the local opposition to the Nantucket windfarm?

Answer: The main reason for the local opposition is that the locals don't want the "ugly" wind turbines ruining their scenery.

5. Using economic logic, explain why Robert Kennedy Jr., a well known environmental advocate who generally favors wind energy, is against the Nantucket wind farm.

Answer: One could make two arguments about this with the first argument the weaker of the two. The first and quite generous interpretation of Kennedy's opposition is that he believes the costs of having the wind farms (in terms of despoiled scenery) are larger than the benefits. The second and less generous interpretation is that Kennedy judges the benefits of the wind farm to him

personally to be less than the cost to him personally (he will suffer despoiled scenery). If Kennedy was a disinterested party, then the first explanation would be more believable, but because he is a resident of Cape Cod, one suspects the second explanation is more likely. One could also argue that, in addition to himself, Kennedy has a political constituency who as a group do not want to “foot the bill” for the public good. He must satisfy his constituency.

Grading: The best answer is one that mentions Kennedy’s own private interests whether this interest is financial or political. It would also mention that the Nantucket homeowners don’t want to pay for (in terms of lost scenery, views, etc.) a public good that is non-excludable. An answer that mentions simply total benefits and total costs, while being valid, receives less-than-full credit.

Questions 6 – 7 refer to reading #2.

6. According to Tom Spellmire, what externality is produced by farms? Is this a positive or negative externality? Who benefits or loses from this externality?

Answer: According to Tom Spellmire, farms produce the externality of rural character/open space. This is a positive externality which is both non-rival and non-exclusive. It is non-exclusive because no one can be excluded from experiencing/enjoying the rural character/open space. It is non-rival because one person’s enjoyment of open space/rural character does not mean the next person can’t also enjoy it. Neighboring landowners—along with anyone else in society who enjoys open space—benefit from this externality.

7. A common approach to reducing urban sprawl is for *privately-owned* land trusts to purchase parcels of land and preserve them as open space. Will this approach lead to an efficient amount of open space? (Hint: focus on the benefits provided by open space to residents).

Answer: The approach of privately-owned land trusts purchasing parcels of land and preserving them as open space will not lead to an efficient amount of open space. In order to be allocated efficiently, the land needs to be a private good (e.g., rival and exclusive). However in this situation, the land is still a public good (e.g., rival and non-exclusive). The land is rival because once the land is purchased no one else can purchase it. However, the land is still non-exclusive – just because the land trust purchased the parcel, others can still enjoy the experience of open space/rural character. And so, the free-riding problem, and inefficiency, will continue.

7. Suppose that you wake up after a week of sleep and you have to decide how many hours you will study for your test. You only have ten hours before the test. The next chart shows the points you get for the hours studied (knowledge) and the point you lose for being tired (concentration loss).

Hour	Knowledge	Concentration Loss	Marginal Benefit	Marginal Cost
1	15	2	15	2
2	29	4	14	2
3	42	6	13	2
4	54	8	12	2
5	65	10	11	2
6	74	12	9	2
7	82	14	8	2
8	89	16	7	2
9	95	18	6	2
10	100	20	5	2

- a) Calculate Marginal benefit and marginal cost for each hour. *In the table.*
- b) What's the marginal benefit and the marginal cost of studying one more hour? *Answer: The MC is fixed at 2, the marginal benefit is decreasing one point by one point (with the exception of the 6th hour, where the marginal benefit decreases two points).*

- c) How many hours will you study?

Answer: 10 hours.

The solution can be found by comparing the marginal benefit (MB) and marginal cost (MC) of studying. In this case we see that MB is always higher than MC so I will always try to study one more hour. The problem is that after 10 hours I have no more time to study because I have to take the test. Although I may think that keep going is a good idea I can not do it because I have to go and sit for the exam (time is a scarce resource).