Econ 350 > Problem Set 2 > Selected Answers

1. MAC2 approaches the cost (vertical) axis but never reaches it. Thus, MAC2 becomes explosively larger as you approach zero emissions. This makes it impossible that optimal emissions could be zero. Optimal emissions could, however, be equal to zero with MAC1.

2. CO emissions
a) graph would go here
b) The optimal emissions during the winter is E = 100. The optimal emissions during the summer is E = 200. A uniform emissions standard of E = 100 would not be optimal during the summer. By allowing additional emissions during the summer, society could reduce abatement costs more than the increased damages that would result.
c) A seasonal emissions standard would seem to cry out. However, one must also consider the administrative costs of implementing such a seasonal system. If the administrative costs associated with switching back and forth between the two standards is too high, it may not be worth it.

3. Gunk
a) Total Abatement Costs rise by $70. Total Damages fall by $47.5. Therefore, the net change to society is -$22.50.
b) The Total Abatement Cost of achieving 12ppm3 is $101. (The Total Damage is $360, making the Total Social Cost $461.)
c) Graphs not attached.
   i) MD falls è optimal Gunk rises
   ii) MD rises è optimal Gunk falls
   iii) MAC falls è optimal Gunk falls

4. Check the text book.

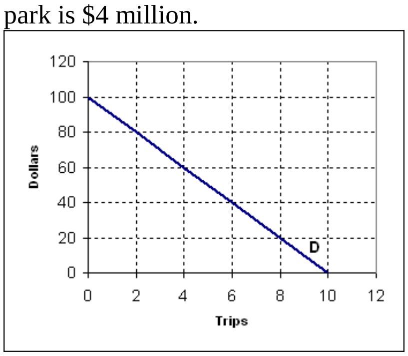
5. To calculate the real value of a variable you would divide its nominal value by a price index.
In 2002 dollars: real abatement costs in 2003 (in terms of 2002 dollars) = [1000/106]*100 = 943.4. Thus, abatement costs rose from $850 to $943.4 in real (constant 2002 dollars) terms.
In 2003 dollars: real abatement costs in 2002 (in term of 2003 dollars) = [850*106]/100 = 901. Thus, abatement costs rose from $901 to $1000 in real (constant 2003 dollars) terms.

6. Check your notes and the book.
7. Check your book on this matter.
8. This is in the text book.

9. Travel Cost
a) The demand curve begins at $15 and slopes downward to the right until it hits the quantity axis at Q = 100.
b) If price is $5, then quantity demanded will be 66.7 trips (ignore the notion that someone could take 7/10ths of a trip). The CS would be $333.5 [= (66.7)($10)(.5)].

10. V = 3000(1/2000) = $6 m

11. a) See graph below.
b) For someone who takes one trip, their WTP must be $90. If the travel cost is $20, then this person's consumer surplus will be $70 (if you want to get technical, you could also add in the little triangle above the $90 price). If the average person takes 4 trips, then their travel cost must be $60. The consumer surplus in this case will be $80. The total expected consumer surplus per year for the park is $4 million.



12. We did this one in class.

13. The PV of the stream of net benefits amounts to about $30.75 million. Since the upfront costs are $20m, the net PV = $10.75m

14. Use the with/without principle in answering this question.

15. I'll let you contemplate this one. (Hint: Draw a demand curve to illustrate what's going on.)

16. This one is for you to ponder.

17. This is a problem better suited to an Excel spreadsheet. Using the 4% discount rate and looking over the course of 100 years, the PV of the costs will outweigh the PV of the benefits, therefore the project will yield negative net benefits. Using a 2% discount rate will generate a larger PV of net benefits since the benefits are delayed in time relative to costs (benefits bump up to $150 per year, but only after the 50th year).

18. Net benefits are maximized at an emissions level of 4 tons/month (where Net Benefits = $33m). The highest benefit/cost ratio occurs at an emissions level of 6 tons/month (where B/C = 3.56). The B/C ratio ignores the possibility of additional net gains to society of further cleanup.

19. Nuclear Waste Facility Cost-Benefit Study

a) No way.

b) Here are eight problems:

i) Study was sponsored by a highly partisan source.

ii) Magnitude of B/C ratio is not meaningful, since benefits may show up as negative costs. Example: This facility has alleged net benefits of 3b, and a B/C ratio of 13. A bit of algebra tells us that benefits must be 3.25b, with costs of .23b. Suppose instead we had lumped all worker exposure under the heading of costs, with total exposure costs being increased exposure at new site (.02b) - decrease exposure at old (.01b) = .01b. This reshuffling would keep the net benefits figure the same at 3.5b, but would change the B/C ratio--(3.25-0.1)/(.23-.01) > 13. Moral: B/C ratio can be padded through accounting changes while net benefits figure won't change.

iii) Discount rate is probably too high.

iv) Omitted cost: health risk reflected in the impact on property values around the site.

v) Through out the employment benefits--new jobs are likely to be matched by layoffs at existing facilities; temporary workers will probably come from outside the county; not all permanent workers would otherwise be unemployed. "Preserved jobs" would be matched by new jobs developing the new electricity capacity. To do this right, you would need to weigh reductions in the number of unemployed in the county against the increase in long-term unemployed at the old site. It is easier to just assume they cancel.

vi) Throw out growth of local service industries, since these will be matched by declines at temporary storage sites.

vii) Risk assessment: what about non-fatal exposure?

viii) Risk assessment: the value of a statistical life can vary anywhere from $2-10m.

c) Lots of details of the benefit-cost study are missing from the summary. I'd want to go over the original with a fine-tooth comb. In particular, given the long-lived nature of nuclear waste, I'd want to know what provisions the company would make to operate and maintain the facility in the event of bankruptcy. Is an environmental bond being proposed?