Economics 5250/6250 Dr. Lozada
Fall 2021 Midterm Exam

This exam has 33 points. There are six questions on the exam; you should work all of them. Do not forget about Question 6, which appears on the last page of the exam, after the figures. You have an hour and 20 minutes (until 11am) to take the exam.

Half the questions are worth 5 points each and the other half are worth 6 points each.

Put your answers to the exam in a blue book or on blank sheets of paper.

Answer the questions using as much precision and detail as the time allows. Correct answers which are unsupported by explanations will not be awarded points. Therefore, even if you think something is "obvious," do not omit it. If you omit anything, you will not get credit for it. You get credit for nothing which does not explicitly appear in your answer. If you have questions about the adequacy of an explanation of yours during the exam, ask me.

For the questions involving figures, if part of your answer involves you drawing on the figure, then you may either: draw on the original figure, then remove it from the exam and include it with your answers; or you may redraw the figure on your answer sheet. If you choose the first option, write your first name on each page (to prevent confusion if the page gets separated from the rest of your exam).

Answer all of the following six questions.

1. **[6 points]**
   (a) Explain the concept of a "Marginal External Cost" curve, and draw and explain an example (any example) of a "Marginal External Cost" curve which we discussed in class.
   (b) Argue that there is a flaw in the concept of the "Marginal External Cost" curve, and that a more correct concept would have two curves, not one. (It will probably be helpful for you to draw an indifference curve map to illustrate your argument.)
2. **[5 points]** How would you defend the position that imposing a socially optimal Pigouvian Tax is unfair to the polluting firms? (You may well not agree with this position, but I am asking you to defend it anyway.)
3. **[6 points]** Thoroughly explain Figure 1. (This includes explaining the cost difference between its different types of pollution control.)
4. **[5 points]** Define "contingent valuation" and describe one advantage it has over other valuation methods.
5. **[6 points]** In Figure 2, suppose:
   - line aa shows the incremental social cost that emitting x tons of methane today causes for each year in the future; and
   - line bb shows the incremental social cost that emitting y tons of carbon dioxide today causes for each year in the future.

   ("Methane" here means methane emitted directly into the atmosphere, not methane which is first burned, because burning methane merely emits carbon dioxide into the atmosphere.) Suppose the incremental social benefit of the economic process that produces x tons of methane is equal to the incremental social benefit of the economic process that produces of y tons of carbon dioxide.
   (a) If the social discount rate is very high, which would have a higher optimal pollution tax, today's emissions of x tons of methane or today's emissions of y tons of carbon dioxide? Why?
   (b) If the social discount rate is very low (but still positive), which would have a higher optimal pollution tax, today's emissions of x tons of methane or today's emissions of y tons of carbon dioxide? Why?

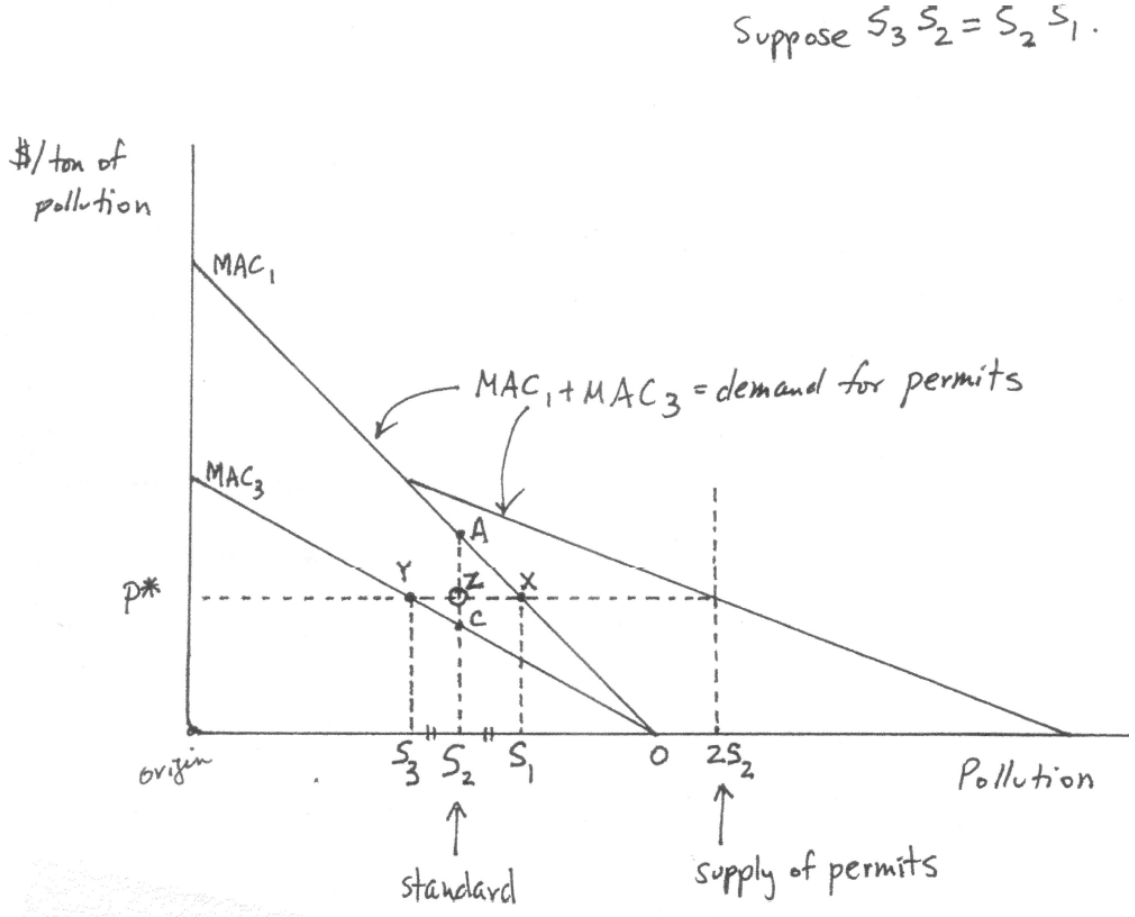
Suppose $S_3S_2 = S_2S_1$.
$/ton of pollution
MAC1
MAC1 + MAC3 = demand for permits
MAC3
A
Y
Z
X
p*
C
origin
S3
S2
S1
0
2S2
Pollution
standard
supply of permits

Figure 1

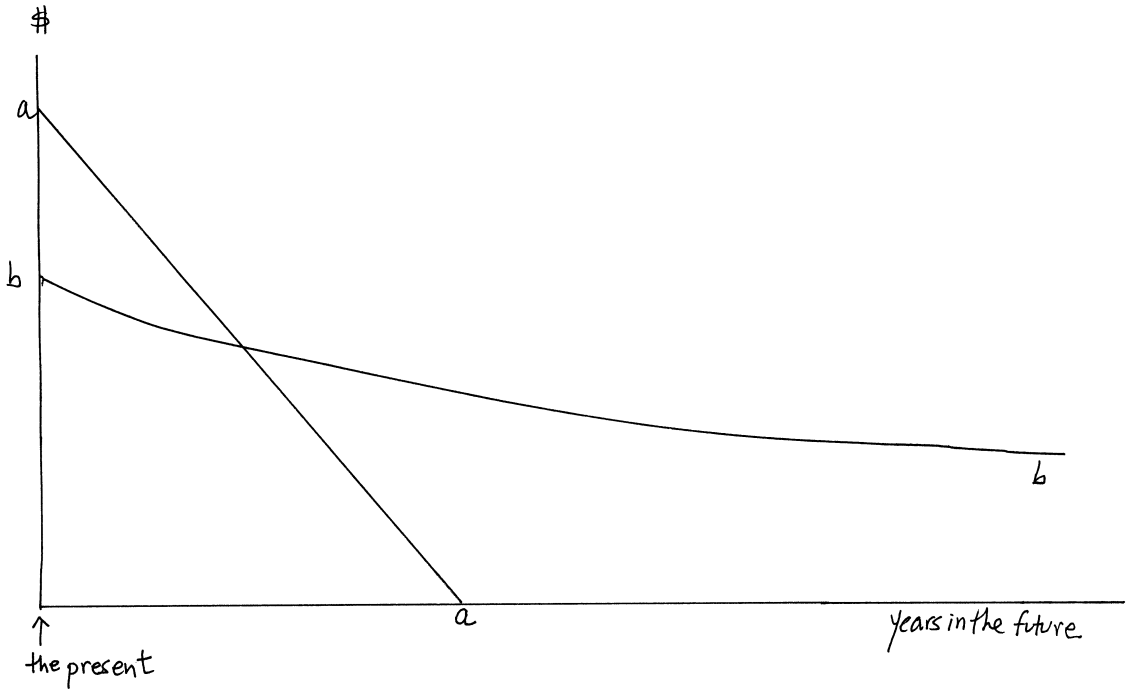

Figure 2

6. **[5 points]** Could an ecocentric philosophy be the outcome of a Rawlsian/contractarian theory of justice in which the moral reference class includes more than just human beings? Why or why not?

Answers to Exam 1, Econ. 5250, Fall 2021

1. **[6 points]** [Chapter 4]

   (a) Marginal External Cost ("MEC") is the increase in "external cost" as output is increased by one unit. (Alternatively, using calculus, it is the derivative of "external cost" with respect to output.) "External Cost" is the damage, measured in dollars, to society of producing this output, and which is not encompassed in any market transactions. For example, pollution is an external cost when pollution victims are not compensated for the damage which pollution inflicts upon them.

   An example of a simple MEC curve is given in Figure 3. (It was not necessary to draw the corresponding External Cost curve.)

   (b) There are (at least) two ways to measure the damage which an externality imposes on its victims. One is their "willingness and ability to pay" ("WATP") (also known as "willingness to pay" ("WTP")) to avoid the externality. The other is their "willingness to accept" ("WTA") compensation in return for suffering the externality. The difference between WATP and WTA is shown in Figure 4. (You only need to show one such pair of indifference curves.) In that figure, WTA is: how many more other goods ("apples") suffice to get you back to your original indifference curve (which is the one going through the black dot) if pollution increases from pol_a to pol_b. WATP is: how many apples you would be willing to give up in return for being able to stay at pol_a instead of "being forced to move to pol_b and having utility shown by the indifference curve that does not go through the black dot."

   MEC could be defined either as marginal WATP or as marginal WTA. Each definition would generate a different MEC curve.

2. **[5 points]** Ch. 6; Fall 2008 Ex1 Qu2

3. **[6 points]** Ch. 8; Fall 2011 Ex1 Qu3

4. **[5 points]** Ch. 10; Fall 2014 Ex1 Qu5

5. **[5 points]** [Chapter 14]

   The present value of the social costs would be $\sum_t(\text{cost}_t/(1+r)^t)$ where r is the social discount rate and cost_t is shown by the graph (Figure 2).

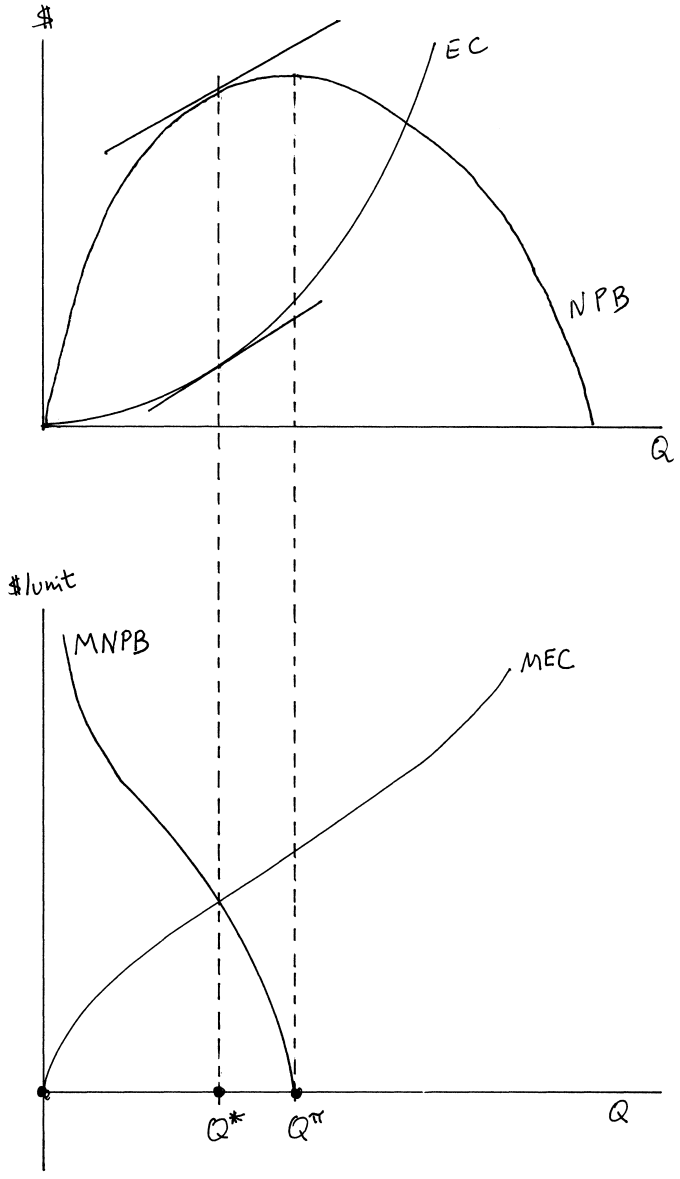

Figure 3. Here Q is an output whose production causes a negative externality quantified as the external cost (EC) curve. The MEC curve is the corresponding marginal curve.

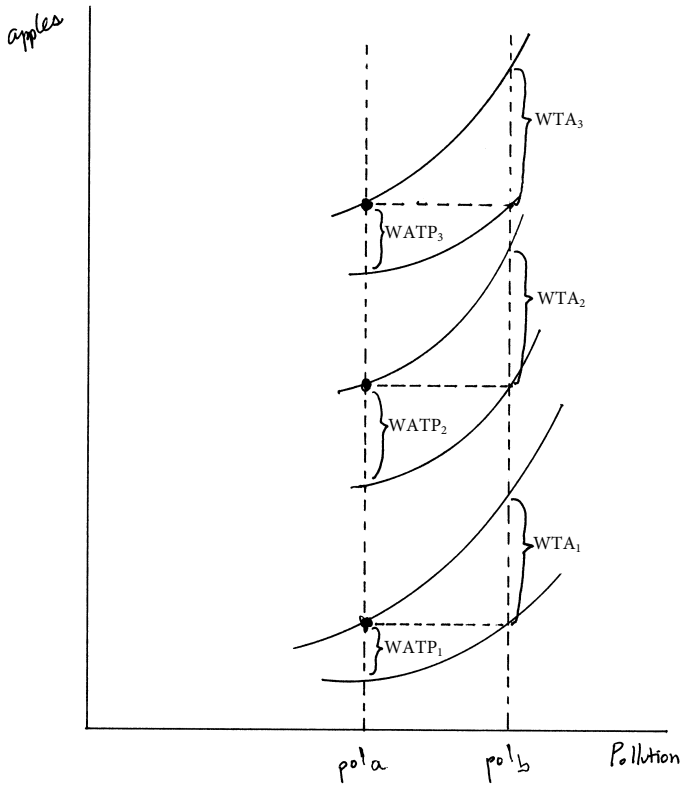

Figure 4. Multiple correct *WATP* and *WTA* values for the move from pol_a to pol_b.

(a) If the social discount rate is very high, what happens in the far future is relatively unimportant compared to what happens now and in the near future. Therefore in the graph, what happens on the left is more important than what happens on the right. Ignoring what's on the right, on the left, the aa line for methane shows higher social cost than the bb line for carbon dioxide. Since the question says that their benefits are the same, emitting x tons methane today is worse than emitting y tons of carbon dioxide today. Therefore, the pollution tax on x tons of methane should be higher than the pollution tax on y tons of carbon dioxide.

(b) If the social discount rate is very low, what happens in the far future is almost as important as what happens now and in the near future. In the graph, weighing what happens on the right almost as highly as what happens on the left, the social cost of carbon dioxide (the bb line) will keep adding up long after the social cost of today's methane emissions (the aa line) are zero. Since the question says that their benefits are the same, emitting y tons carbon dioxide today is worse than emitting x tons of methane today. Therefore, the pollution tax on y tons of carbon dioxide should be higher than the pollution tax on x tons of methane.

6. **[5 points]** [Chapter 15; Spring 2001 Ex1 Qu5]

A Rawlsian/contractarian theory of justice supposes that the members of the moral reference class—in this case, not only humans—make the rules for society under a "veil of ignorance," which means they do not know what their position in society is. John Rawls believed this would lead to social rules maximizing the well-being of the worst-off member of society. In the case posed in the question, the answer is 'yes,' and Rawls would predict that the social rules would maximize the well-being of the worst-off member of this entire moral reference class—a class understood to include its non-human members. Such social rules would be rather ecocentric (which means valuing the ecosystem first, before anthropocentric concerns).