ECON 331: Environmental Economics

PRACTICE Exam 1, Fall 2025

- Define any variables you need to answer the problems.
- All materials except for your cheat sheet should be put away before beginning the exam. Use of cell phones during the exam for any purpose is forbidden.
- Please write your answers in the space provided.
- Keep your answers short but clear. Your goal is to convince a skeptical grader that you understand the relevant concepts well enough to answer the question you are given.
- The questions on the exam sum to 30 points. Your cheat sheet is worth up to 3 points, for a total possible points of 33 on this exam.
- Remember to turn in your cheat sheet with your exam.
- Good luck on your Econ test!

1. (2 points) What is your name?

1 True/False Questions

Indicate "T"rue or "F"alse for each of the following statements or claims. For each false statement, if you correctly and clearly explain why it is false, I will give you a bonus point. No explanations necessary for claims or statements. which you think are true.

2. (2 points) Suppose that you and a team of economists are working to figure out how to regulate a new pollutant that the scientific community has realized is a cause of cancer in the community. You have figured out through reading the literature that the socially optimum level of emissions for this pollutant is 0.10 ton per person. However, you are unable to estimate an MAC curve because the firms that produce this pollutant are private, and their data is confidential. **Claim**: In this instance a tax per ton of pollutant would be the better policy instead of issuing a number of pollution permits equal to the socially optimum amount of pollution.

3. (2 points) **Claim**: If the MDF curve is perfectly flat, than any Pigouvian tax above the marginal external cost of emissions at the socially optimal point will destroy the market (e.g. the new quantity traded will be 0).

4. (2 points) Suppose we are using our Econ 160 Supply and Demand diagram. We have a Demand curve (MPB) and a Supply curve (MSC). Now suppose we have both an external cost and an external benefit. Further, suppose the MEC=MEB. For example, suppose MEC=MEB=5. **Claim**: Under such a scenario the competitive equilibrium quantity is equal to the socially optimal quantity.

2 Multiple Choice Questions

Circle the best answer to each question. There is only one answer for each question. No explanation necessary.

5. (2 points) Suppose we are looking at the market for water pollution emitted by cargo ships, and we measure emissions in millions of tons of CO2 per year. Suppose even with the most advanced technology we could not reduce emissions below 2 million tons of CO2 per year. **Question**: Which of the following is true based on what we have learned in class and the information provided in the question?

    A. The MAC becomes a vertical line at E=2.

    B. The MAC becomes a horizontal line at E=2.

    C. The MAC is undefined at E=2.

    D. The MAC touches the vertical axis at E=2.

6. (2 points) Suppose a candy-maker and a doctor open business across the street from each other. The candy-maker, in order to make candy, generates noise that makes it impossible for the doctor to think. The candy-maker earns a profit of $40 per day. The doctor is unable to work, and makes $0 with the noise. If the doctor could work, he would earn $60 per day. There exists soundproofing equipment for candy-making machinery, which costs $15 per day. The candy-maker has the right to operate his business, and transactions costs are low. Assume the doctor's only choices are shut down or operate, and the candy-maker's only options are shut down or operate. **Question**: According to what we have learned in class, which option describes the outcome you would predict to occur?

    A. The doctor shuts down and the candy-maker operates.

    B. The doctor operates and the candy-maker shuts down.

    C. Both operate, the soundproofing is installed, and the candy-maker pays for it.

    D. Both operate, the soundproofing is installed, and the doctor pays for it.

7. (2 points) Suppose that Evil Company Inc has a terrible reputation for contributing to air and water pollution in the community in which they operate. Also suppose that they are the only producer of bottled water in the community. The locals protest Evil Company for producing bottled water to the point where Evil Company perceives their MPC of producing bottled water as above the MSB of the bottled water. **Question**: According to what we have learned in class, this would result in the competitive equilibrium of bottled water _____ the socially optimal quantity, and from a policy perspective we would implement a Pigouvian _____.

   A. above, tax.

   B. above, subsidy.

   C. below, tax.

   D. below, subsidy.

3 Short Answer Questions

These questions all require an explanation. Remember you are trying to convince me you understand the why and the how of what you are doing, not simply getting the answer correct. Cite specific concepts from class in your answers for full credit.

8. **How Should We Reduce CO2 Emissions?**. Suppose we can divide the producers of CO2 (carbon-dioxide, the most-common greenhouse gas) into 3 large categories. 1. Electricity generation/usage. 2. Transportation (airplanes, cargo ships, personal cars). 3. All other sources. We will measure emissions in Million Metric Tons (MMT) of CO2 per year. We will measure costs as dollars per MMT. Just like in class, A will represent the MMT of C02 abated per year overall, and little a a will represent abatement in a particular sector.

   You determine the following information.

   - MAC for electricity generation: 2a.
   - MAC for transportation: 4a.
   - MAC for all other sources: 5a.
   - MDF for total emissions from all sectors (E): 9+0.5E.
   - Unregulated emissions from electricity generation: 50MMT.
   - Unregulated emissions from transportation: 30MMT.
   - Unregulated emissions from all other sources: 20MMT.

   (a) (4 points) Rewrite the MAC curve for each sector using emissions rather than abatement.

(b) (6 points) Write down the steps you would use to solve for the social optimum overall and for each sector. Include specific mathematical equations you would use to solve. Explain your answer.

(c) (6 points) How would you use this socially optimum quantity to determine the optimal pollution tax on each sector and the amount of pollution permits to issue to each sector? Explain your answer.