ECON 331: Environmental Economics

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 42 points. Your cheat sheet is worth up to 4 points, for a total possible points of 46 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 we do not know the MAC curve nor the MDF curve for a given pollutant, but we do know the socially optimal amount of pollution. Policymakers plan to implement pollution permits, one for each unit of pollution, but are unsure whether to allow the permits to be traded between firms or not. **Claim**: Whether the permits or tradeable or not will affect how many pollution permits should be issued in order to achieve the socially optimal amount of pollution.

3. (2 points) Suppose there exists a pollutant that impacts human health if it is present, but the size of that impact does not change with the amount of emissions of this pollutant. That is to say that if emissions are 0, there are no damages. If emissions are any positive amount, total damages are $D, **regardless** of the quantity of emissions. For simplicity, assume marginal damages just at 0 emissions is also 0. **Claim**: With such a pollutant and a typical MAC curve from class, the socially optimal amount of emissions is unregulated (or market) emissions.

4. (2 points) Suppose we calculate the socially optimal amount of fertilizer emissions in the local river at 5 tons per year. At this quantity we estimate the negative external cost due to the fertilizer pollution at $200. The local population protests these emissions through a media campaign and boycotts. The fertilizer firm estimates the marginal costs of these actions is $250. Assume the firm's abatement cost increases with abatement, and that the marginal damage function of fertilizer emissions increases with emissions. **Claim**: Based on what we have learned in class, there is no need for governmental intervention because moral suasion alone brings the market to the socially optimal quantity of fertilizer emissions.

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 you have 10 firms, all with different marginal abatement costs for the same pollutant. You know with certainty all 10 MAC curves. You are unable to determine the true MDF curve for this pollutant. **Question**: Based on what we have learned in class, which below represents the optimal policy in terms of cost-effectiveness you would choose in this situation.

    A. Command and Control.

    B. Pollution tax.

    C. Tradeable pollution permits.

    D. All 3 are equally optimal/costly.

6. (2 points) Use the information from the previous question. Instead of the optimal policy in Question 5, policymakers instead used an estimated MDF curve to set and implement an emissions tax on each unit of emissions. The estimated MDF underestimated the true marginal damages. That is to say for each quantity of emissions, the true marginal damages is higher than the estimated marginal damages. Now consider the firm with the highest abatement cost. Compared to the socially optimum policy, this firm will face a _____ pollution tax and therefore abate _____ emissions. **Question**: Based on what we have learned in class, pick the option that best completes this sentence.

    A. higher, more.

    B. lower, more.

    C. higher, fewer.

    D. lower, fewer.

7. (2 points) Suppose 2 neighbors are arguing over when to mow the lawn/cut the grass in the yard. Neighbor A wants to mow at 6am because the temperature is cooler. Neighbor A values this benefit in terms of not feeling hot and sweaty at $20 per mow. Neighbor B works the late shift at work, and loses sleep when Neighbor A mows in the morning. Neighbor B values this lost sleep at $15 every time Neighbor A mows. Assume Neighbor A, if unable to mow at 6am, won't mow at all. **Question**: If Neighbor A has the right to mow the lawn at any time, and the assumptions of the Coase Theorem hold, which option below indicates the predicted outcome based on what we have learned in class?

    A. Neighbor A mows the lawn at 6am and no money changes hands.

    B. Neighbor A mows the lawn at 6am and pays Neighbor B $15 per mow.

    C. Neighbor A mows the lawn at 6am and pays Neighbor B $5 per mow.

    D. Neighbor A does not mow the lawn at 6am and Neighbor B pays Neighbor A $20 per mow.

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. NYSGE, a private company, is deciding whether it should hire another construction company to build a hydroelectric damn on the Susquenhanna river in Binghamton. Suppose that building this damn is a one-time decision. Either the damn is built or it is not built. NYSEG estimates that the revenue from selling electricity to households from this damn is $4 million over the course of the damn's lifespan. The construction company building the damn estimates that building the damn will cost $5 million.

   (a) (6 points) Does the hydroelectric damn get built under the competitive equilibrium? Explain why or why not.

   (b) (6 points) In addition to the information above, consider that building a damn creates a large reservoir on the backside of a damn. Suppose the area that will become the reservoir is empty, and so there will be no costs associated with the creation of this reservoir. Instead, the lake will create space for recreation (such as kayaking and fishing) and the space for a lakeside park. Broome County estimates that this reservoir will create $2 million additional revenue for private business in Broome County.
   Question Does the hydroelectric damn get build under the social optimum? Explain why or why not.

(c) (6 points) In order to ensure the damn is built, what is the minimum Broome County is willing to subsidize the construction of the hydroelectric damn? What is the maximum? Explain

9. (10 points) Your friend is having a hard time understanding why an article in the Economist (a journal with economics articles and news) talks about how the social optimum amount of benzene (a chemical in gasoline) is much higher than the social optimum amount of sulfur dioxide (the cause of acid rain). Reading the article, you see that for firms the marginal cost to reduce the amount of benzene emissions by 1 ton is 10 times as high as the marginal cost to reduce the amount of sulfur dioxide by 1 ton, for any level of emissions. The addtional cost to society of 1 ton of additional benzene missions is always equal to the additional cost to society of 1 additional ton of sulfur dioxide emissions.

   Question: Using appropriate graphs and concepts from class, how would you explain to your friend why the socially optimum amount of benzene emissions is higher than the socially optimum amount of sulfur dioxide emissions?