

Midterm Exam: Energy Economics 399

Friday, February 27

4 essay/short answer questions (multiple parts), 100 points, 50 minutes

Students must work independently. Students may use no other materials except a pen or pencil, an eraser, a ruler, and a calculator. Answer all questions in the space provided on this test sheet.

The College of the Holy Cross Honor Code states that students may neither give nor receive help on an exam. Any student in violation of the Honor Code may receive an 'F' for that particular test. So, fair play, please. Good luck on the test!

1. For \$800 you can currently buy a photovoltaic solar panel that generates 160 watts of electricity at peak power. In Massachusetts' climate, solar panels operate on a year-round basis at roughly 13% of peak efficiency. Utility rates in Massachusetts average roughly 15 cents/kwh.

For practical purposes, photovoltaic solar panels require no maintenance and have an unlimited lifetime. Based on your knowledge of energy economics, would it make sense to install photovoltaic solar panels on your Massachusetts home? Explain, and show your work. (30 points)

2. Assume your utility can be represented by the function $U = \ln(\text{income})$. Now imagine you are offered the chance to purchase a raffle ticket for a cost of \$100 that gives you a 1 in 1,000 chance of winning \$250,000. (30 points)
 - a. Suppose you are a poor college student earning \$10,000 per year. Should you buy this ticket? Explain, and show your work.
 - b. Suppose you are a rich college graduate earning \$100,000 per year. Should you buy this ticket? Explain, and show your work.
3. Suppose the demand for a depletable good like natural gas is $P = 20 - q$ in each period. Assume the marginal cost of extracting natural gas is constant over time and production and $MC = 4$.

Assume that a monopolist produces the natural gas over two periods but that the total amount of natural gas is 10 units and the discount rate is 10%. How much natural gas will be sold in each period, what will be the price, what will be the monopolist's profits, and how much consumer surplus will the consumer realize?

Now suppose that the natural gas regulator places a price ceiling on the gas of $P = 12$. Again, assume that a monopolist produces the natural gas over two periods but that the total amount of natural gas is 10 units and the discount rate is 10%. How much natural gas will be sold in each period, what will be the price, what will be the monopolist's profits, and how much consumer surplus will the consumer realize? (30 points)

4. The recently passed stimulus package contains \$6.5 billion in subsidies for energy efficiency projects for low and middle income households. Given the fact that taxes and subsidies generally result in dead-weight loss, why would anyone believe that this spending will result in an increase in societal welfare? Give at least three reasons. (10 points)