

THE PENNSYLVANIA STATE UNIVERSITY  
Department of Economics

Economics 428  
Homework 2  
Due September 23

Gallant  
Fall 2021

This is an individual assignment in the sense that each individual must submit his or her answers. However, you should feel free to work with another classmate to solve the problems. Ultimately, it is important that each individual understand how to solve these problems because questions similar to these will appear on exams. Turn in via Canvas.

1. Consider the market for electricity. Suppose demand (in megawatt hours) is given by  $Q = 42 - P$  and that the marginal private cost of generating electricity is \$10 per megawatt hour ( $P$  is in the same units). Suppose further that smoke is generated in the production of electricity in direct proportion to the amount of electricity generated. The health damage from the smoke is \$15 per megawatt hour generated. (What is meant here is that MC and MD are 10 and 15 respectively, not  $10Q$  and  $15Q$ .)
  - (a) Suppose the electricity is produced by an unregulated monopolist. What price will be charged, and how much electricity will be produced?
  - (b) In part (a), what is the consumer surplus from the electricity generation? What is the total surplus, taking into account the pollution damage?
2. The market for paper in a particular region in the United States is characterized by the following demand and supply curves:

$$Q_D = 160,000 - 2,000P \text{ and } Q_S = -40,000 + 2,000P,$$

where  $Q_D$  is the quantity demanded in 100-pound lots,  $Q_S$  is the quantity supplied in 100-pound lots, and  $P$  is the price per 100-pound lot. Currently there is no attempt to regulate the dumping of effluent into streams and rivers by the paper mills. As a result, dumping is widespread. The marginal external cost ( $MEC$ ) associated with the production of paper is given by the curve  $MEC = 0.0006Q_S$ .

- (a) Calculate the output and price of paper if it is produced under competitive conditions and no attempt is made to monitor or regulate the dumping of effluent.
  - (b) Determine the socially efficient price and output of paper.
  - (c) Explain briefly why the answers you calculated in parts (a) and (b) differ.
3. There are three groups in a community. Their demand curves for public television in hours of programming,  $T$ , are given respectively by

$$W_1 = \$100 - T,$$

$$W_2 = \$300 - 2T,$$

$$W_3 = \$400 - 2T.$$

Suppose public television is a pure public good that can be produced at a constant marginal cost of \$200 per hour.

- (a) What is the efficient number of hours of public television?
- (b) How much public television would a competitive private market provide?