
Midterm 2

You have until 3:20pm to complete the exam, be certain to use your time wisely. Answer all questions directly on the exam. You must show all of your work to receive full credit. Non-graphing calculators may be used (no graphing calculators or phones can be used). You may leave answers as fractions. Unless a problem says otherwise, you can assume that firms can produce fractions of units and charge non-integer prices (so a firm could produce 82.4 units and sell at a price of \$5.325 per unit). Remember to put your name on the exam. Good luck!

Name:

ID Number:

1. (15 points) Suppose that electricity rates in Virginia were regulated for several years under traditional rate of return regulation. State regulatory agencies are considering a switch to using price caps to regulate electricity rates in an attempt to get utility companies to make greater efforts to reduce costs.
 - (a) Aside from adjusting prices to account for cost savings, what other factors should regulators incorporate into the price changes under a price cap system?
 - (b) Suppose that regulators look at the rate at which electricity generation costs have fallen over the past several years controlling for changes in input prices to determine the rate at which technological innovation takes place in the industry. Explain why this would underestimate the rate of technological change that will take place under a price cap system.

2. (25 points) Suppose that Apple is considering spending an amount X on research and development to find a cheaper way to produce iPads. The market demand for iPads is given by:

$$D(p) = 2000 - 2p \quad (1)$$

Currently, Apple's marginal costs of producing an iPad are \$200. If Apple spends X on research and development, the marginal costs of producing an iPad will be reduced to \$100.

- (a) Find the price Apple will charge for an iPad if they decide not to engage in any research and development. Assume that Apple is the only producer of iPads.
- (b) What is the largest value of X for which Apple would decide to engage in research and development? Assume that Apple is the only producer of iPads and any innovations they make will be relevant only to the production of iPads (the innovation would not be helpful to manufacturers of other tablets).
- (c) Suppose that costs of research and development are \$50,000 higher than the cutoff you found in part (a), meaning that Apple would not choose to engage in research and development. The government is interested in maximizing total surplus in the market for iPads and is considering subsidizing Apple's R&D costs. Should the government subsidize Apple by contributing \$50,000 toward research and development costs? Use numerical evidence to support your answer.
- (d) How would you expect your answers for parts (b) and (c) to change if Apple's innovations were useful to other electronics manufacturers? You do not need to give exact numbers but you should explain which results would change and what direction they would change in.

3. (25 points) Suppose that Congress is considering making patent lengths industry specific. The legislators are debating the patent lengths for drugs that treat rare diseases and for drugs that treat common conditions. Assume that very few drugs currently exist to treat the rare diseases, making demand for a new drug very inelastic. Also assume that many drugs already exist for common conditions, making demand for a new drug for a common condition very elastic (but still greater than zero).
- (a) Given the differences in the elasticity of demand for the two types of drugs, which type should have the longer patent life? Your answer should be based on the difference in elasticity and you should assume that the goal in each market is to set the patent length to maximize total surplus. Be certain to fully explain your answer (graphs of the two markets may be helpful).
 - (b) Suppose that companies choose to devote all of their research and development to just one type of drug. If the patent lengths are the same for each type of drug, would you expect a company to invest in developing a drug for a rare disease or a drug for a common condition? Be certain to fully explain your answer including clearly stating any additional assumptions you are making about demand for the drugs.
 - (c) Is the outcome in part (b) efficient? Is it equitable? Be certain to explain your reasoning.

4. (10 points) Explain two different reasons that traditional rate of return regulation could lead to higher operating costs in the long run for a natural monopoly at any given quantity than the firm would have producing the same quantity under no regulation.

5. (25 points) James City County is accepting bids for the local cable franchise. There are several cable companies all with the same average cost and marginal cost curves. The average cost function for each firm is:

$$AC(y) = 100 - \frac{1}{20}y \quad (2)$$

where y is the number of customers the firm serves. The inverse demand function for cable in James City County is:

$$p(y) = 200 - \frac{1}{5}y \quad (3)$$

where y is the number of customers who would subscribe to cable if the price were $p(y)$. The franchise will be auctioned off in the following way. The auctioneer will start by announcing a price of \$200 per customer. If multiple firms are willing to provide service at this price, the price will be lowered by a penny. This will continue until there is only one firm remaining. This firm will get the franchise and must provide service to whoever wants it at the lowest price reached during the auction process.

- (a) Given the average cost function above, is it efficient for James City County to only grant a single firm the cable franchise or would it be more efficient to allow multiple firms to have franchises? Be certain to fully explain your answer using the information given in the problem.
- (b) What price will result from the bidding process? How many customers will subscribe to cable at this price?
- (c) Suppose that James City County modifies the auction process in the following way. The format of the auction stays the same and the winner of the auction must still provide service to whoever wants it at the lowest price reached during the auction. However, in addition to providing service at this price, the cable company must also pay a fee to the county equal to 20% of its total revenues (so if the firm charges p , they actually get to keep $0.8p$). With the addition of this fee, what price will result from the auction and how many customers will subscribe to cable?
- (d) Explain why the result in part (c) is less efficient than the result from part (b). Your answer should include a calculation of the change in total surplus resulting from the introduction of the fee.