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. 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. (20 points) There are two firms that are competing to provide cable access for Williamsburg. Firm A plans to install inexpensive infrastructure that has low initial costs for installation but then high marginal costs for adding customers. Firm B plans to install more expensive infrastructure that will have higher initial installation costs but then lower marginal costs. The average cost and marginal cost functions for the two firms are given by:

$$AC_A(y) = 50 - \frac{1}{12}y \tag{1}$$

$$AC_B(y) = 40 - \frac{1}{14}y \tag{2}$$

$$MC_A(y) = 50 - \frac{1}{6}y \tag{3}$$

$$MC_B(y) = 40 - \frac{1}{7}y \tag{4}$$

The demand function for cable as a function of price (p) is given by:

$$D(p) = 200 - 2p \tag{5}$$

 (a) Explain why it is more efficient to have a single cable company operate in Williamsburg than to have both cable companies operate. Be certain to make specific reference to the cost functions above to justify your answer.
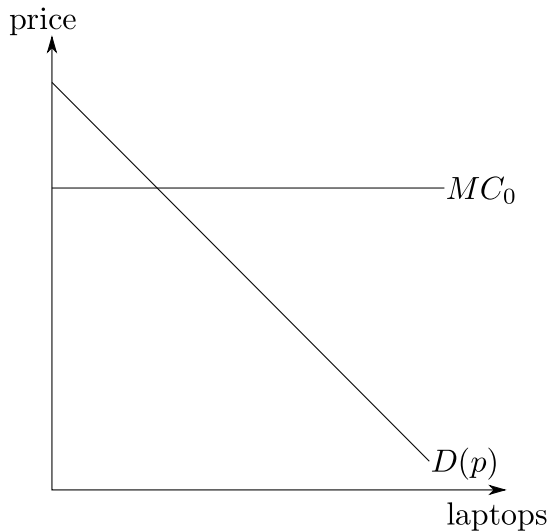
(b) At what price would firm A just break even? At what price would firm B just break even?

(c) Suppose that the franchise is auctioned off in the following way. The Williamsburg regulator starts at a price of $100 (the price at which demand hits zero). If both firms are willing to provide service at that price, the regulator lowers the price by $5 and sees if both firms are still willing to provide service. This process continues, with the price being lowered in $5 increments, until there is only one firm willing to provide service at the price. That firm wins the franchise and has to provide service at that last price. Which firm would win the rights to the cable franchise and what would the firm's profits be?

2. (a) (10 points) The graph below shows market demand for laptops and the marginal cost curve for a single firm. Suppose that a firm discovers a major invention that lowers marginal costs (they are still constant with respect to quantity). The firm is able to keep its new invention private. Use the graph to show how the effect of this invention on market price will differ depending on whether the industry was initially competitive or whether the firm was initially a monopoly. You should clearly label the change in price if the industry was competive, the change in price if the industry was a monopoply, and any relavant points or curves you used to find those changes.

price

MC_0

$D(p)$

laptops
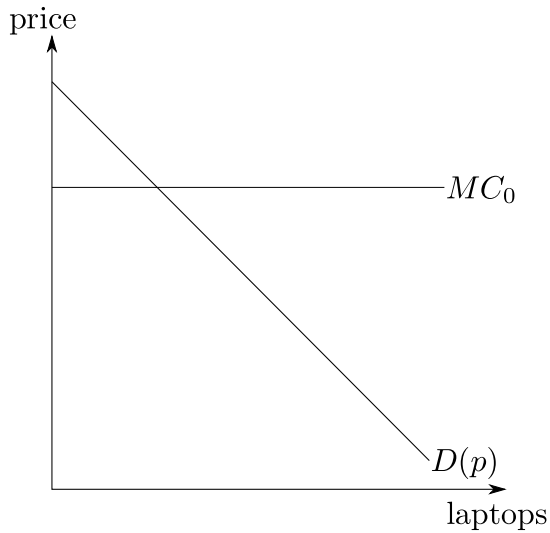
(b) (10 points) On the graph below, show the change in consumer surplus resulting from the invention. Assume that the industry was initially competitive, the invention was a major invention and the firm can keep the invention private. Clearly label any relevant points and curves.

price

MC_0

$D(p)$

laptops

3. (15 points) A local politician argues that prescription drug prices are too high and that we should place price caps on prescription drugs. Explain two different reasons why this proposal could lead to less efficient outcomes in the market for prescription drugs in the long run.

4. (10 points) Williamsburg currently has the efficient level of electricity generating capacity. In other words, the marginal costs of electricity on units beyond the current capacity would exceed the marginal benefits to consumers of those units. Currently, peak demand for electricity is substantially larger than off-peak demand. Over the next year, several people are going to buy electric cars that need to be charged. To handle this additional demand for electricity, the city can either expand capacity or run an ad campaign convincing electric car owners to charge their cars during off-peak hours. Which approach should Williamsburg take? Be certain to fully explain your answer. Assume that electric car owners have the same marginal benefit from charging their cars whether they do it during peak or off-peak hours.

5. (25 points) The graph below shows the total research and development costs for a firm $(C(I))$ as a function of the level of innovation (I) that takes place as a result of that research. The graph also shows the present value of the future profits the firm will receive from innovation $(PV(\pi_I))$ as a function of the level of innovation. This present value of the profits from innovation assumes a 20 year patent length and zero profits for the firm after the patent runs out. These profits do not take into account the research and development costs.

   Note that the level of innovation rises linearly with research and development spending up to the level of innovation I^*. After that point, innovation still rises linearly with research and development spending but at a different rate.
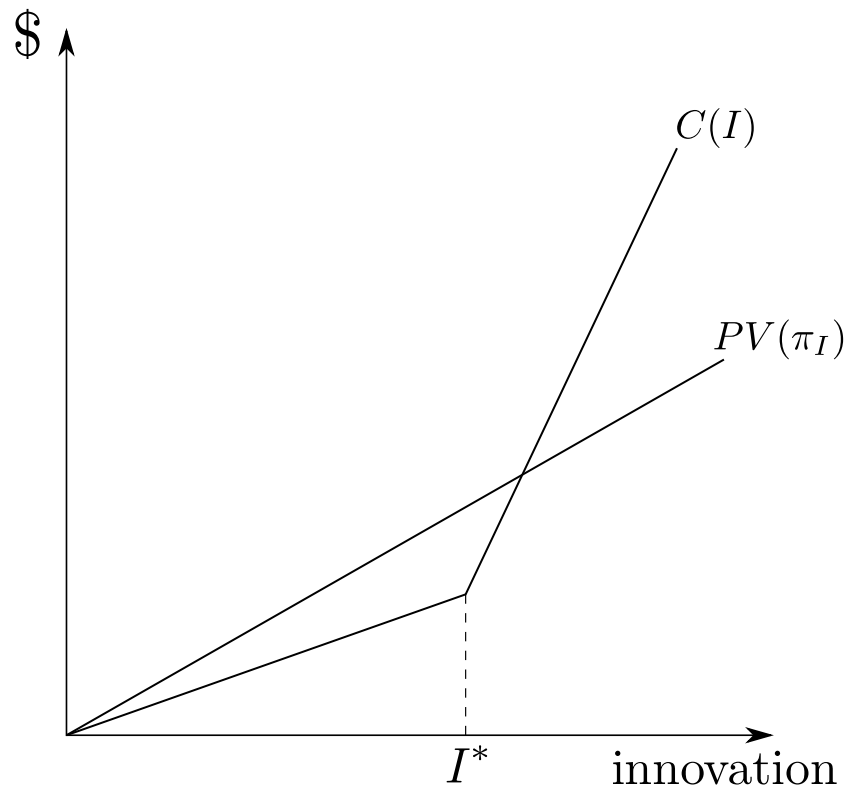
   (a) Show on the graph what the firm's optimal amount of spending on research and development is and what the firm's level of innovation will be as a result of that spending.

   (b) Suppose that the government increases the patent length from 20 years to 25 years. Use the graph to show the effect this policy change will have on the firm's research and development spending, the level of innovation that takes place and the firm's net profits from that innovation.

Problem is continued on the next page.

(c) Given you answers in parts (a) and (b), how would you recommend the government change patent length in order to achieve a more efficient outcome? Be certain to fully explain your reasoning and any additional assumptions you are making.

6. (10 points) Suppose that the goal of regulators in the United States is to maximize the total surplus of American consumers and American firms. They do not care about the welfare of firms or consumers outside of the United States. Given these goals, a politician proposes that we continue to enforce patents and copyrights held by American firms but that we do not enforce patents and copyrights held by foreign firms. The politician claims that this would increase consumer surplus and would only harm foreign firms. Do you agree that this change in policy would increase total surplus in the United States? Be certain to fully explain your answer.