
Final Exam

You have until 3:30pm 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. (20 points) Busch Gardens is the only local theme park and is deciding how much to charge for each ride on a roller coaster. The marginal cost of letting one additional person ride a roller coaster is zero. The demand for rides is given by the following inverse demand function:

$$p(R) = 5 - \frac{1}{100}R \quad (1)$$

where R is the total number of rides.

- (a) Suppose that Busch Gardens decides to sell tickets for individual rides (rather than charge an admission fee). What is the profit-maximizing price per ride Busch Gardens will charge and how many tickets will be sold?
- (b) What is the efficient quantity of rides? Calculate the deadweight loss associated with the outcome in part (a).
- (c) Suppose that Busch Gardens decides to use a two part tariff, charging an admission fee and then selling ride tickets. In order to maximize profits, what should Busch Gardens charge in admission fees and what should it charge for each ride ticket? Note: You can think of the demand curve as the demand curve for a single customer, in which case you are finding the admission fee charged to that one customer and the price per ride ticket for that customer.

2. (20 points) A firm has two different factories that it can use to produce notebook computers, factory A and factory B . The total cost and marginal cost functions for these two factories are given by:

$$C_A(N_A) = 1000 + 10N_A^2 \quad (2)$$

$$MC_A(N_A) = 20N_A \quad (3)$$

$$C_B(N_B) = 2000 + 20N_B^2 \quad (4)$$

$$MC_B(N_B) = 40N_B \quad (5)$$

where N_A is the number of notebooks produced in factory A and N_B is the number of notebooks produced in factory B .

- (a) If the firm is going to produce a total of N notebooks, what fraction of these notebooks should it produce at factory A and what fraction should it produce at factory B in order to minimize costs? You can assume that the firm has to pay any fixed costs associated with a factory even if it produces zero notebooks at that factory.
- (b) Derive an expression $C(N)$ giving the total costs of producing N notebooks assuming the firm divides output between the factories in the optimal way.
- (c) Find the firm's supply function, $N(p)$, assuming that the industry for notebook computers is perfectly competitive.
- (d) How would your answer to parts (a) and (b) change if instead of the total cost and marginal cost functions above you were told that the factory total cost functions were $C_A(N_A) = 1000 + 10N_A$ and $C_B(N_B) = 2000 + 20N_B$? Be as specific as possible.

3. (20 points) Each firm in a competitive industry has the following total cost and marginal cost functions:

$$C_i(y_i) = 160 + 10y_i^2 \quad (6)$$

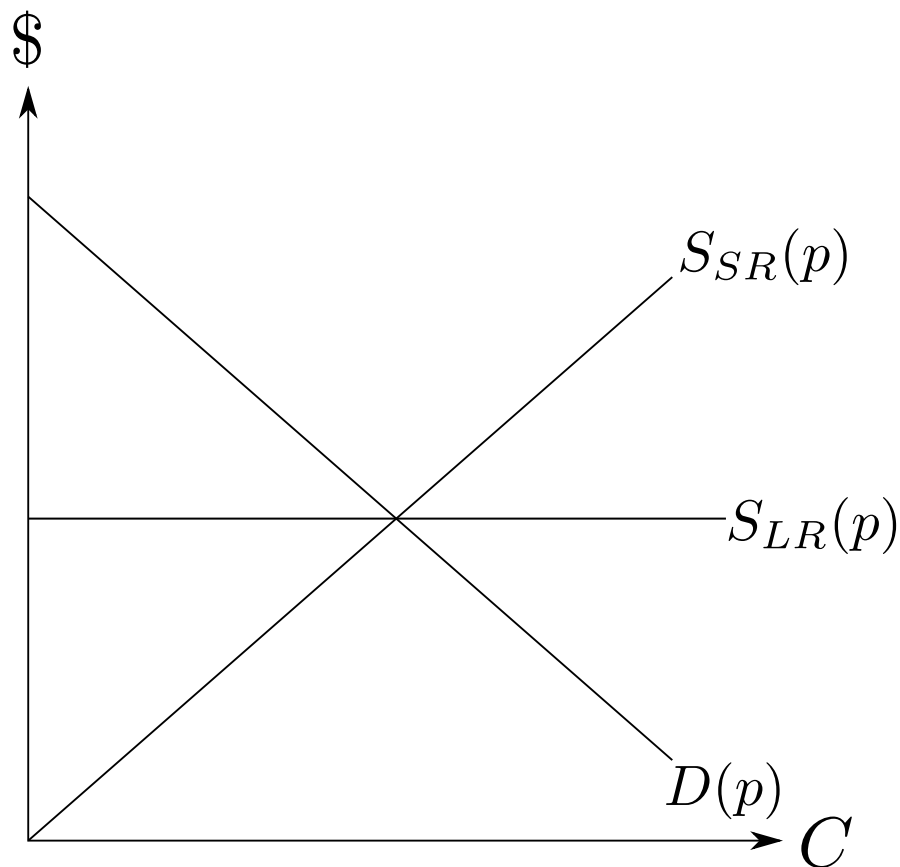
$$MC_i(y_i) = 20y_i \quad (7)$$

where y_i is that individual firm's output. Demand for the industry is given by the following inverse demand function:

$$p(y) = 100 - \frac{2}{5}y \quad (8)$$

- (a) Find the shutdown price and the breakeven price for an individual firm.
- (b) Suppose there are currently 50 firms in the industry. What will the each firm's profits be in the short run?
- (c) What will the number of firms be in the long run? Note: You can have fractions of firms.

4. (15 points) The graph below shows the supply and demand curves for the market for coffee. Note that both the short run and long run supply curves are given. The market for coffee is highly competitive. The market is currently at the long run equilibrium price and quantity. Suppose that a news report is released showing that coffee has greater nutritional benefits than previously thought. Show the short run and long run effects of this news report on the price and quantity of coffee sold. Be certain to clearly label any relevant points and curves you add to the graph.



5. (15 points) In the market for speakers, customers have a linear, downward sloping demand curve for watts (a rough measure of how powerful the speakers are). Speaker companies have total costs that increase linearly with watts leading to constant marginal costs. Speakers generate a negative externality for neighbors. Each extra watt causes harm to neighbors from the extra noise. However, the marginal impact of this harm is gets smaller as the number of watts increase. Draw a graph below that has watts (W) on the horizontal axis and dollars on the vertical axis showing the following:

- The private and social marginal benefit curves for watts.
- The private and social marginal cost curves for watts.
- The equilibrium number of watts in a competitive market with no government intervention.
- The efficient number of watts.
- The size of a quantity tax on watts that would lead to the efficient number of watts.

6. (10 points) There are two farmers selling oranges at the farmers market. The two farmers each decide how many oranges to bring and then the price that they can sell their oranges for is determined by the market demand curve:

$$D(p) = 100 - 25p \tag{9}$$

where $D(p)$ is the total number of oranges bought from both farmers combined at the price p . Farmer A 's costs go up by \$2 for each extra orange he brings to the farmers market. Farmer B 's costs go up by \$1 for every extra orange she brings to the farmers market. Find an expression giving farmer A 's optimal number of oranges to bring to the market (O_A) as a function of the number of oranges farmer B brings to the market (O_B).