

Homework 3

due Tuesday, October 16, in class

Problem 1 Suppose you are the manager of a watchmaking firm operating in a competitive market. Your cost of production is given by $C = 200 + 2q^2$, where q is the level of output and C is total cost. (The marginal cost of production is $4q$; the fixed cost is \$200.)

- If the price of watches is \$100, how many watches should you produce to maximize profit?
- What will the profit level be?
- What is the smallest the price can be for the firm to produce in the short-run? In the long-run?

Problem 2 Each of 100 firms in a competitive market has a cost function of $c(Q) = 72 + 2Q^2$, meaning each firm has a marginal cost of $MC = 4Q$. The market demand curve is $Q^D = 600 - 5p$.

- Solve for the short-run equilibrium price and quantity (hint: first, solve for an individual firm's supply curve, and then multiply the quantity by 100 to get the market supply curve).
- What profit level will each firm earn in the short-run?
- In the long-run, will there be entry or exit from the market? Explain. What number of firms will be active in the long run?

Problem 3 Magee's Bakery, in downtown Lexington, estimates that its demand for transparent pies has a price elasticity of -1.5 .

- Suppose Magee's were to increase its price. In which direction would each of the following move: revenue, total costs, profit? For each, answer "increase", "decrease", or "uncertain", along with a brief explanation.
- Suppose Magee's were to decrease its price. In which direction would each of the following move: revenue, total costs, profit? For each, answer "increase", "decrease", or "uncertain", along with a brief explanation.
- Finally, suppose for part c only that you now have the additional information that the marginal cost to Magee's of making one transparent pie is \$2 (and is constant). Magee's currently charges \$5 for each transparent pie. Should they increase or decrease this price, or should they leave it at \$5?

Problem 4 Answer the following two questions about perfectly competitive markets:

- There are many taxi drivers in New York City, all of whom sell identical taxi rides. Taxi drivers in New York are required to hold a special license to operate, and the government only issues 5,000 licenses. Will these drivers necessarily earn zero profit in the long run, or is it possible for them to earn positive profit?
- Carlos owns a gas station in Lexington. Carlos estimates his total costs are given by $TC = 400 + .01q^2$ and his marginal costs are given by $MC = .02q$. The price of gas is currently \$3.75/gallon. Should Carlos stay in business in the long run? In the short run?

Problem 5 John runs the only carwash in town; he is a monopolist. John estimates his daily demand for carwashes is given by the expression $Q = 100 - 4P$, where Q is the number of carwashes drivers will purchase at price P . It costs John \$5 in electricity, soap, etc to run the carwash once. Additionally, John has fixed costs of \$300/day.

- a. What price should John set for a carwash? What will be his daily profit at this price?
- b. If John were to lower his price by \$1, he would sell more carwashes, and still be able to charge a price above his marginal cost. Explain intuitively why it would not be profit-maximizing to do so.
- c. What is John's elasticity of demand at his profit-maximizing price? Is it elastic or inelastic? If it is elastic, why does he not lower his price, as this would surely bring in many more customers? If inelastic, why does he not raise his price?

Problem 6 Suppose a profit-maximizing monopolist is producing 800 units of output and is charging a price of \$40 per unit.

- a. If the elasticity of demand for the product is $\epsilon = -2$, find the marginal cost of the last unit produced.
- b. What is the firm's percentage markup of price over marginal cost?
- c. Suppose that the average cost of the last unit produced is \$15 and the firm's fixed cost is \$2,000. Find the firm's profit.

Problem 7 Skywalker Farms supplies water to the town of Mos Eisley (they are "the water company", i.e. a monopoly supplier). Given their infrastructure of pipes, treatment centers, etc, the marginal cost of supplying one gallon of water is only \$.50 (and is constant), though maintaining their infrastructure has a daily fixed cost of \$75,000. Mos Eisley's daily demand for gallons of water is $P = 20 - \frac{1}{1000}Q$.

- a. Solve for Skywalker Farm's profit-maximizing price. What daily profit do they earn when they charge this price?
- b. Emperor Palpatine, in a rare burst of populism, suggests regulating Skywalker Farms by capping the price they are allowed to charge at \$9/gallon of water. What profit will Skywalker Farms earn at this price?
- c. You are hired as a consultant to advise the Galactic Empire on this matter. Explain in words why such a price ceiling might be a good idea (i.e. could such a price ceiling be welfare-improving? Consult page 372, on natural monopoly).