

**Economics 101**  
**Homework #5**  
**Spring 2009**  
**Due 04/28/2009 in lecture**

**Directions:** The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Please remember the section number for the section **you are registered**, because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

**Problem One**

Suppose the total cost of production for a firm is given by the equation:  $TC = 8q + q^2 + 400$ .

This firm's marginal cost equation is:  $MC = 8 + 2q$ .

Market demand is given by:  $P = 100 - Q$ .

a) Give the formulas for: fixed cost, variable cost, average total cost, average variable cost.

Now suppose this firm is operating in a perfectly competitive market (in which all firms have access to the same technology and hence face the same costs).

b) What is the long run equilibrium price in this market?

c) Calculate the economic profit earned by a perfectly competitive firm in the long run.

Now suppose the cost equations given (and derived) above belong to a monopolist.

d) What quantity will the monopolist produce?

e) What price will the monopolist charge?

f) What is the monopolist's economic profit?

g) What is the monopolist's producer surplus?

Now consider a monopolist in a different market with costs:  $TC = q^2$ ,  $MC = 2q$ .

Suppose market demand is given by:  $P = 100 - q$ .

h) Give the formulas for: fixed cost, variable cost, average total cost, average variable cost.

i) What quantity will this firm produce?

j) What price will consumers face in this market?

k) Calculate the monopolist's economic profit.

l) Calculate the monopolist's producer surplus.

m) Looking back over this problem, under what conditions is a firm's economic profit = producer surplus?

## **Problem Two**

A representative firm has an average total cost curve that is described by the equation:

$$ATC = \frac{100}{q} + \frac{q}{9} + 10.$$

The firm's marginal costs equation is:  $MC = 10 + \frac{2}{9}q$ .

Market demand is given by:  $Q = 25 - \frac{1}{2}P$ .

- Sketch ATC, MC, MR (you need to derive this), and the market demand curve. Hint: to draw ATC you may want to plot points then connect the dots. Assume that the firm perceives that the market demand curve is the demand curve for the product they are producing.
- Suppose the representative firm is an unregulated monopolist. What quantity will they produce and what price will they charge?
- Is the monopolist's chosen level of output allocatively efficient? Explain your answer.
- Is there any way to regulate the firm to achieve allocative efficiency in the long run without government intervention beyond price regulation? Why or why not?

Now suppose the government decides that 18 units of the good should be produced.

- Suppose two firms meet this level of output by each producing 9 units. What is the total cost of production?
- What would be the optimal number of firms if we wanted to produce 18 units at minimum cost per unit? Hint: look carefully at the shape of the ATC function.
- How would we describe this market?

## **Problem Three**

A monopolist has costs given by:  $TC = Q^2$ ,  $MC = 2Q$ .

A monopolist faces demand from two groups of consumers.

Demand from class 1 is given by:  $Q_1 = 15 - \frac{1}{2}P$ .

Demand from class 2 is given by:  $Q_2 = 40 - 2P$ .

- Which group of customers has the more elastic demand curve?
- Which group do you expect will pay a higher price under 3<sup>rd</sup> degree price discrimination?
- A market research firm offers to provide the monopolist with information which would allow it to identify which class any given consumer belongs to. What is the maximum amount the monopolist would be willing to pay to hire the company? Hint: to solve this problem find the monopolist's profit if it cannot price discriminate and compare to the monopolist's profit if it can price discriminate. Please show all the steps you take to find the monopolist's profit.

### Problem Four

You and your little sister can each choose between two strategies. Each of you will make your choice of strategy at the same time (i.e. neither of you can wait for the other to move first).

Each of the following matrices shows the strategies available and the payoff from each strategy choice. The payoff is shown with payoff to you first, then your little sister. Assume a larger number payoff is superior to a smaller number payoff.

a. Find the dominant strategy for player (if one exists).

		Your Little Sister	
		Cry	Throw things
You	Threaten	4,4	16,24
	Bribe	48,8	0,32

b. Find the dominant strategy for each player (if one exists).

		Your Little Sister	
		Lie	Truth
You	Tell Mom	10,2	8,12
	Tell Dad	1,6	6,3

c. Find the dominant strategy for each player. Who ends up with the highest payoff?

		Your Little Sister	
		Look cute	Freak out in public
You	Ignore	20,20	8,12
	Placate	16,24	0,16