

**14.01, 2007 Fall  
Problem Set 10  
Due: December 7th**

1. Please write your name, the name of your TA, and your section/recitation time (e.g. MWF 10am, or F 1 pm) on top of your solutions.
2. Problem sets are due IN SECTION/RECITATION. Late Problem sets will not be accepted under any circumstances.

**Questions:**

1. Are the following statements true, false or uncertain?
  - a. Since many of the products we buy every day are produced by firms that compete in monopolistically competitive markets, the inefficiencies in our economies are large because each market is generating some dead weight loss.
  - b. The main reason why policymakers are concerned about inflation is because it raises wages, therefore costs of production. As a result output and employment necessarily will go down.
2. Two firms with 0 marginal costs compete by choosing price. Their demand functions are

$$Q_1 = 20 - P_1 + P_2 \tag{1}$$

$$Q_2 = 20 + P_1 - P_2 \tag{2}$$

- a. Suppose the two firms choose their price simultaneously. What are the prices, quantities and profits of each firm in the resulting Nash Equilibrium? How do we call this type of competition? How is it different from Cournot competition? Why we do not get the result that  $P_1 = P_2 = MC$ ?
  - b. Suppose Firm 1 sets its price first and Firm 2 sets its price after observing Firm 's 1 price. What are the prices, quantities and profits in equilibrium?
  - c. What firm has an advantage in this setup? Why?
3. Firm A and B are deciding between producing high or low quality product. The profit of each firm depends on the action taken by its competitor. The payoff matrix is:

		Firm B	
		H	L
Firm A	H	50, 40	60, 45
	L	55, 55	15, 20

- a. Find the maximin strategies of each firm.
  - b. Find the Nash Equilibria of this game. Explain why they are equilibria by checking potential deviations.
  - c. Now suppose that the firms take their actions sequentially. Write the extensive form game if Firm A moves first and find the equilibrium of that game.
  - d. Suppose you are the CEO of Firm A and you still decide the quality of the product first. The CEO of Firm B goes on national TV and says "I don't care what Firm A is going to do. I'm going to produce high quality products (H) because I don't like low quality stuff". What would you do?
  - e. What will be the equilibrium if Firm B moves first? Is there a first or second mover advantage? How does this relate to your answer in 2d? Why?
  - f. How is this game different than the Prisoner's Dilemma.
4. Imagine you are a professor at MIT and you are considering hiring Research Assistants (RA). If you hire an RA for  $L$  hours your RAs will produce an amount of research output given by  $Q = 12L - L^2$ . You value the output of their research by \$10.
    - a. Find the Marginal Revenue Product of Labor and draw it.
    - b. Suppose there are 100 professors like you at MIT. Find the aggregate demand for RA labor.
    - c. Students at MIT have a large opportunity cost for working as RA (spending their time studying 14.01), so their aggregate supply for RA work is given by  $L_s = 15w$ . Find the wage of equilibrium in the MIT RA market.
    - d. How many hours of RA work would you hire at that wage?
    - e. Are the labor demands you found the conditional or the unconditional demands? Briefly describe the difference between them and draw a diagram showing both.