Economics 1200 Fall 2003

Homework # 2

Write your answers to the following questions on separate sheets of paper. Your answers are due in class on Wednesday, October 1. Late homeworks are not accepted.

1. Consider the two-round home bargaining game discussed in class. The minimum the seller will sell his home for is $188,000 and the maximum the buyer is willing to pay is $200,000. Both players know these two amounts and are bargaining over the difference, M=$12,000. Assume the disagreement values are 0 for both players. Player 1 moves first by making a proposal and Player 2 can accept or reject it. If Player 2 rejects Player 1's proposal, then Player 2 gets to make a proposal, which Player 1 can accept or reject. The game is then over. Suppose that both players discount future income at the rate d=.2 per period. That is, $0.20 now is equivalent to $1.00 received next round.
   a. Use rollback to find the equilibrium for this 2-round game. What is the sale price of the home? Which player gets the larger share of M?

   Now suppose there is no limit to the number of alternating bargaining rounds and Player 1 continues to move first.

   b. Use rollback reasoning to find the equilibrium price in this case. Which player prefers an unlimited number of rounds to just two rounds, Player 1 or Player 2?

2. In each of the following three games, each player can choose between two actions, "cooperate" or "defect". Suppose that in all three games, higher payoff numbers are preferred to lower payoff numbers. For each game, find all of the *pure* strategy Nash equilibria. Show/explain how you found these equilibria.

   a. Prisoner's Dilemma

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	70,70	10,80
	Defect	80,10	40,40

   b. Stag Hunt

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	70,70	5,40
	Defect	40,5	40,40

   c. Chicken

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	70,70	50,80
	Defect	80,50	40,40

3. Suppose that Pat and Sam intended to communicate with each other about what to do tonight but the message never got through. Now each has to simultaneously and independently decide where to show up (communication is no longer possible). There are just two possibilities – a ball game or a concert. Other things equal, Pat likes ball games better, and Sam likes concerts better. Both Pat and Sam agree that either event would be more fun if the other person were also there. However, Pat and Sam differ in their attitudes about how important it is that they be there together. Since Pat is choosing between the game or the concert and Sam is facing the same two choice, there are four possible outcomes. The table below shows how Sam and Pat rank these four outcomes.

Outcome	Pat's Ranking	Sam's Ranking
Best	Pat at game, Sam at game	Sam at concert, Pat at concert
Second Best	Pat at game, Sam at concert	Sam at game, Pat at game
Third Best	Pat at concert, Sam at concert	Sam at concert, Pat at game
Worst	Pat at concert, Sam at game	Sam at game, Pat at concert

   a. Write down the normal form of this game. Choose payoffs that are consistent with the rankings given in the table above. Assume there are no ties (e.g. "best" is strictly better than "second best", which is strictly better than "third best" which is strictly better than "worst").
   b. Find the Nash equilibrium (or equilibria) of this game. Does either player have a dominant strategy? Explain.

4. Dixit and Skeath Chapter 4, exercise # 10, pp. 122-123.

5. Consider the continuous version of the Cournot duopoly game discussed in class. There are two firms, 1 and 2, which manufacture a homogeneous good. Each firm chooses quantities to produce, q_1 and q_2, respectively so as to maximize profits. The price they receive per unit of the good is given by p = max [a-b(q_1+q_2), 0]. Each firm's constant marginal (per unit) cost is c>0.
   a. Show that in the Nash equilibrium of the Cournot game, the quantities that each firm brings to market are:
   $$q_1 = q_2 = \frac{a-c}{3b},$$
   the equilibrium price p=(1/3)a + (2/3)c, and the profits earned by each firm are:
   $$\pi_1 = \pi_2 = \frac{(a-c)^2}{9b}.$$
   Hint: use the best response functions derived in class to get the quantities, then use these to determine price and finally, firm profits.

   b. Now consider a "cartel" version of the same game, where firms 1 and 2 collude (and act as though they are a joint monopolist). In this case, the firms solve the following profit maximization problem:
   $$Max_{q_{1q},q_2}\pi = [a - b(q_1 + q_2) - c](q_1 + q_2)$$
   Notice that the only difference between the cartel and the duopoly profit maximization problem is that in the cartel, the two firms acknowledge that their profits depend on total production (q1+q2), not individual production, so the

maximization problem is a little different. The quantity that each firm produces in the cartel can be thought of as a production quota (as in OPEC).

i. Write down the first order conditions from the above joint profit maximization problem (i.e. find the expressions: $d\pi / dq_1 = 0, d\pi / dq_2 = 0$).
ii. Solve these two equations for the cartel quantities (quotas) q_1, q_2. Then find the cartel price p, and the profit earned by each firm.
iii. Compare the cartel quantity, price and profits with the Cournot Nash equilibrium quantity, price and profits you found in part a. Explain in words why these amounts differ between the two cases.