

### Problem set 5

- 1) Three oligopolists operate in a market with inverse demand function given by  $P(Q) = a - Q$  where  $Q = q_1 + q_2 + q_3$  and  $q_i$  is the quantity produced by firm  $i$ . Each firm has constant marginal cost of production,  $c$ , and no fixed cost. The firms choose their quantities as follows: (1) firm 1 chooses  $q_1 > 0$ ; (2) firm 2 observes  $q_1$  and then chooses  $q_2$ ; (3) firm 3 observes  $q_1$  and  $q_2$  then chooses  $q_3$ . Find the subgame perfect outcome.
- 2) Consider the following normal form game where Player 1 chooses the row (either T or B), Player 2 chooses the column (either r or l), Player 3 chooses the table (either R or L)

		Player 3			
		L		R	
		Player 2		Player 2	
		l	r	l	r
Player 1	T	1, 1, 1	0, 0, 0	0, 0, 0	0, 0, 0
	B	0, 0, 0	0, 0, 0	0, 0, 0	4, 4, 4

- a) find all Nash equilibria in pure strategies
- b) assume that player 1 moves first, then player 2 and finally player 3; every player, before to play, observes the choices of the predecessors.
- a. Represent the game using the extensive form
  - b. Find all subgame perfect Nash equilibria
- 3) Three periods sequential bargaining. Two players, 1 and 2, are bargaining over \$1 using the following bargaining procedure (alternating offers):
- Period 1: Player 1 proposes to take a share  $s_1$  of the dollar, leaving  $1 - s_1$  for player 2; Player 2 either accepts (game ends) or rejects (Play goes to period 2)
- Period 2: Player 2 proposes a share  $s_2$  of the dollar for player 1, leaving  $1 - s_2$  for player 2; Player 1 either accepts (game ends) or rejects (Play goes to period 3)
- Period 3: Players receives 0.1 dollars.
- Players do not discount future payoffs, i.e. factor  $\delta = 1$ .
- Find the backward induction outcome and describe the subgame perfect Nash equilibrium