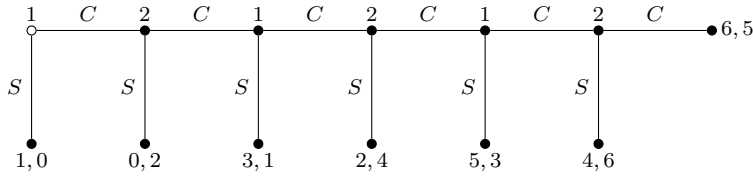


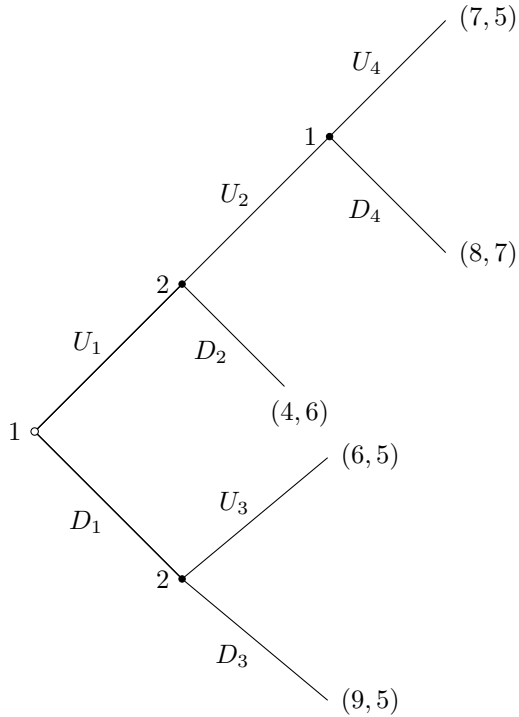
ECON 203.02 - Problem Set 7

Spring 2021

1. **(Centipede Game)** Find the backward induction equilibrium of the game in the following figure.



2. Consider the following game



- Find all (pure) Nash and subgame perfect equilibria of the game above.
- Determine the corresponding strategic game. For each subgame perfect equilibrium, specify an order of iterated elimination of weakly dominated strategies that preserves the corresponding equilibrium. Can the same be done for the game's Nash equilibria?

3. Consider a price competition between two companies selling products that are close substitutes. Namely, if firm A charges P_A , and firm B charges P_B , then the quantity that firm A sells is $Q_A = 1 - P_A + \alpha P_B$ and quantity that firm B sells is $Q_B = 1 - P_B + \alpha P_A$ (where α is a small positive constant $0 < \alpha < 1$). Assume that the marginal cost of production is zero. Assume that firm A has to choose its price (P_A) first. After this decision is observed, firm B chooses its price (P_B).

Draw the game tree and provide backward induction equilibrium.

4. Initially there is one firm in a market for cars. The firm has a linear cost function: $C(q) = 2q$. The market inverse demand function is given by $P(Q) = 9 - Q$.

- What price will the firm charge? What quantity of cars will the firm sell?
- How much profit will the firm make?
- Now, a second firm enters the market. The second firm has an identical cost function. What will the Cournot equilibrium output for each firm be?
- What is the Stackelberg equilibrium output for each firm if firm 2 enters second?
- How much profit will each firm make in the Cournot game? How much in Stackelberg?
- Which type of market do consumers prefer: monopoly, Cournot duopoly or Stackelberg duopoly? Why?

5. Suppose three firms compete in a market for a single product with industry inverse demand curve $p = A - Q$. All three firms have constant marginal cost m . Firm 1 is a leader and selects output level q_1 . Firms 2 and 3 are followers and select q_2 and q_3 after q_1 . Note, q_2 and q_3 are chosen simultaneously. Total output is $Q = q_1 + q_2 + q_3$. Find a subgame perfect Nash equilibrium solution.
6. Consider three firms in an industry such that each firm $i = 1, 2, 3$ produces quantity q_i . In fact, firms produce their output sequentially, that is firm 1 produces first q_1 , then, in the second stage, firm 2 produces q_2 , and then, in the third stage, firm 3 produces q_3 . The market price is given by:

$$p = 120 - Q$$

where $Q = q_1 + q_2 + q_3$. The marginal cost of production is assumed to be the same for all firms and constant and equals to c . Determine the subgame perfect Nash equilibrium of this game.