EconS 424- Strategy and Game Theory
Homework #4 - Due date: Wednesday, April 7th.

1. **Exercises from Harrington's textbook:**

   (a) Chapter 9: exercises 6, 8, and 9.

2. Consider the sequential-move game depicted in Figure 1. The game describes Apple's decision to develop the new iPhone with a radically new software which allows for faster applications (apps). These apps are, however, still not developed by app developers. If Apple does not develop the new iPhone, then all companies make zero profit in this emerging market, If, instead, the new iPhone is developed, then company 1 (the leader in the app industry) gets to decide whether to develop apps that are compatible with the new iPhone's software. Upon observing company 1's decision, the followers (firm 2 and 3) simultaneously decide whether to develop apps (D) or not develop (ND). Find all SPNE in this sequential-move game.

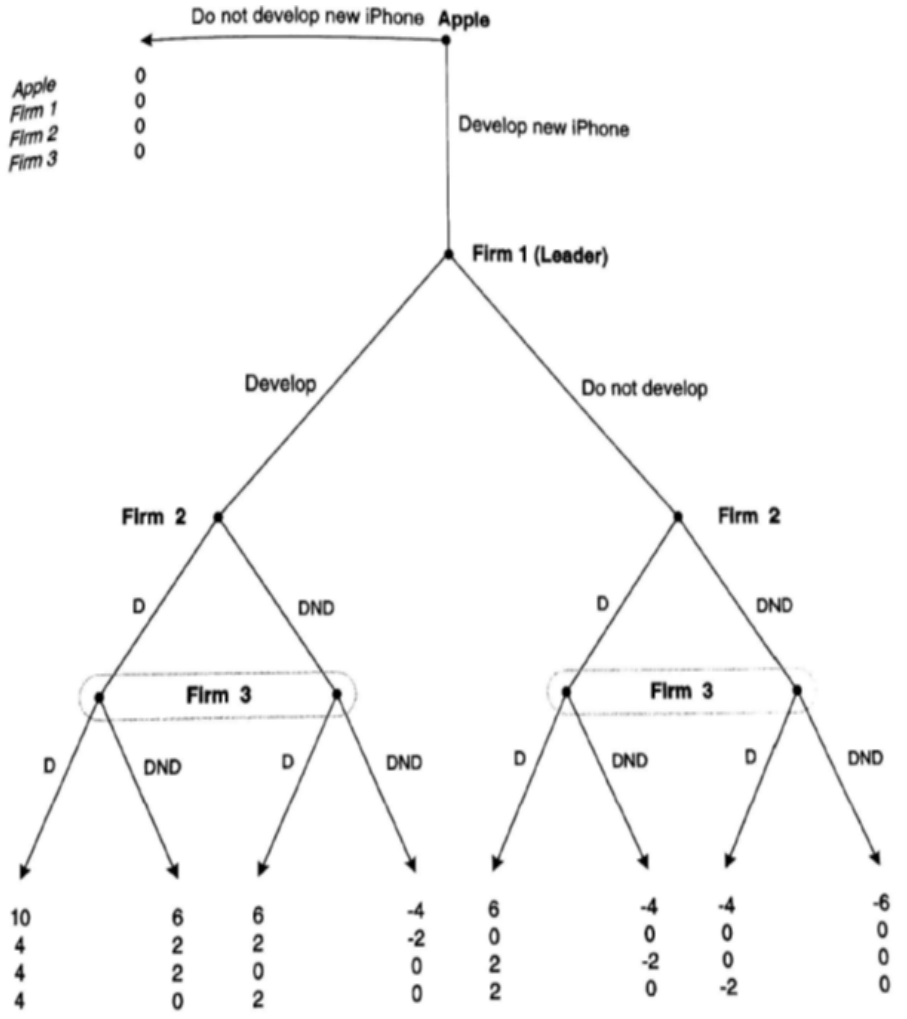
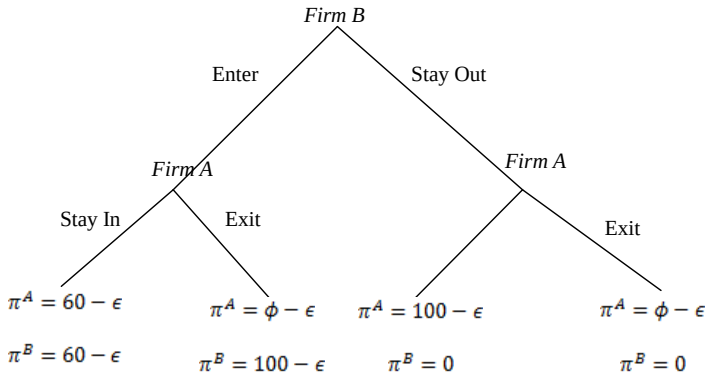


Figure 1

3. Let us analyze an entry-exit two-stage game in which firm A is the incumbent and firm B is a potential entrant. In stage I, firm B chooses whether to enter into A's market or whether to stay out. The cost of entry is denoted by ϵ. In the second stage, firm A decides whether to stay in the market or exit.



The game tree reveals that firm A can recover some of its sunk entry cost by selling its capital for the price ϕ, where $0 \leq \phi \leq \epsilon$.

a. Obtain the subgame-perfect equilibrium strategies of both firms assuming that $\epsilon < 60$. Prove your answer.

b. Answer the above assuming that $60 < \phi \leq \epsilon < 100$

4. Consider a leader and a follower in a Stackelberg game of quantity competition. Firms face an inverse demand curve $p(Q) = 1 - Q$, where $Q = q_L + q_F$, denotes aggregate output. The leader faces a constant marginal cost $c_L > 0$ while the follower's marginal cost is $c_F > 0$, where $1 > c_F > c_L$, indicating that the leader has a cost advantage.

(a) Find the follower's best response function.

(b) Determine each firm's output strategy in the SPNE of this sequential-move game.

(c) Under which conditions on c_L can you guarantee that both firms produce strictly positive output levels?