



## Recitations 20

### [Definitions used today]

- SPE, Backward Induction, Behavioral Strategies, Linear Game, Perfect Recall, Dalkey and Kuhn Theorems

### Question 1 [84 III.1 Spring 2009 majors]

An extensive form game (EFG) is said to be linear if every information set is crossed at most once by every history.

- Give an example of an EFG which is not linear.
- Give an example of EFG that is linear but not of perfect recall.
- Compare linear games and games with perfect recall. Is one of the two a subset of the other? Prove your answer.

### Question 2 [32 and 45 IV.2 Spring 2006 III.1 Spring 2007 majors]

Consider extensive form games that are finite (that is, that have a finite set of nodes).

- a) Give an example to show that in an extensive form game a behavioral strategy may not have an equivalent mixed strategy
- b) Define an extensive form **linear game**.
- c) Prove that for any linear game, any player in the game, and any behavioral strategy of the player there is a mixed strategy of the same player that induces the same probability distribution on final nodes for any pure strategy of the other players.
- d) Give an example to show that in a linear game for a mixed strategy of the player there may be no behavioral strategy that induces the same distribution on final nodes for some pure strategy of the other players.

### Question 3

Find all SPE and NE of following games

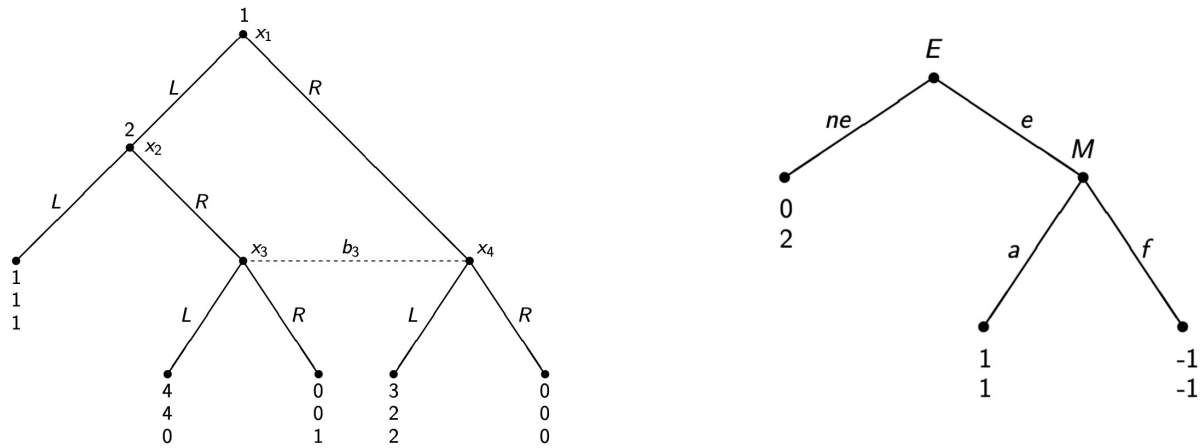


Figure 1

**Question 4 [Final 2019]**

- Prove that for any finite EFG of perfect information, there is a last move node, that is a move node  $x$  such that  $IS(x) \subseteq Z$ .
- Prove, or disprove by showing a counter-example to the statement: In any finite EFG of perfect recall, there is a last information set  $I^i$  for some player  $i$ , that is, an information set such that for any node  $x \in I^i$ ,  $IS(x) \subseteq Z$ .