

Algorithmic Game Theory

Summer Term 2026

Exercises 6

04/06/2026

Problem 1.

Explain the two ways, with either **Player1** or **Player2** moving first, of representing an $m \times n$ two-player normal-form game as an extensive-form game that has the given game as its strategic form. In both cases, how many decision nodes do the players have? What is the number of terminal nodes of the game tree? Why do we need information sets here?

You can work with the following example that illustrates a 2×3 game:

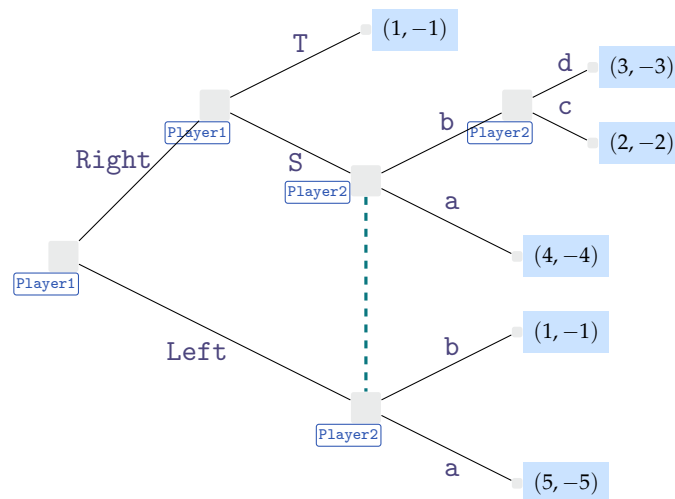
(Player1, Player2)	a	b	c
T	(0, 0)	(1, 1)	(2, 2)
B	(3, 3)	(4, 4)	(5, 5)

Problem 2.

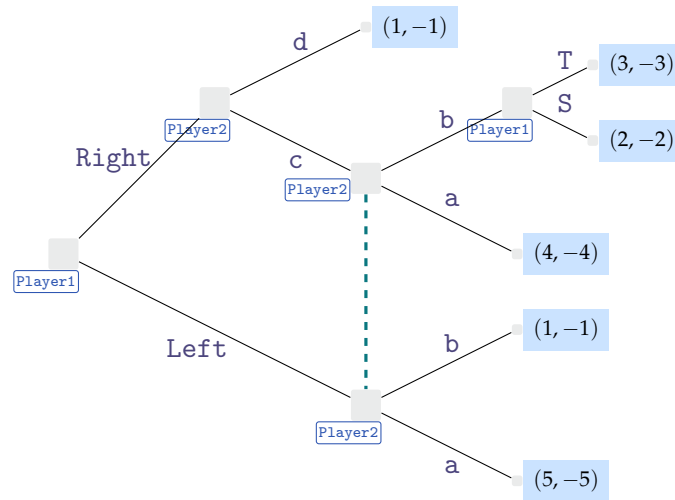
Which of the following extensive-form games have perfect recall and if not, why not?

For each extensive-form game with perfect recall, find all its equilibria in pure strategies. You can work with reduced strategies.

Game 1:



Game 2:



Problem 3.

Consider the following zero-sum game, a simplified version of Poker adapted from Kuhn (1950). A deck has three cards (of rank High, Middle, and Low), and each player is dealt a card. All deals are equally likely, and of course the players get different cards. A player does not know the card dealt to the other player. After seeing his hand, player I has the option to Raise (R) or to Fold (F). When he folds, he loses one unit to player II. When he raises, player II has the option to meet (m) or pass (p). When player II chooses “pass”, she has to pay one unit to player I. When player II chooses “meet”, the higher card wins, and the player with the lower card has to pay two units to the winning player.

- (a) Draw a game in extensive form that models this game, with information sets, and payoffs to player I as the leaves. Moreover, label each edge where Nature performs a move with its respective probability.
- (b) Simplify this game by assuming that an information set where a player’s move is always at least as good as the other move, no matter what the other player’s move or the chance move were or will be, then the player will choose that move. Draw the simplified extensive form game.
- (c) What does the simplification in (b) have to do with weakly dominated strategies? Why is the simplification legitimate here?