

1. In the following zero-sum game
 - (a) For each of the Row player's strategies, fix that strategy and find the corresponding strategy of the Column player that minimizes the Row player's payoff.
 - (b) Determine the Row player's maxmin strategy, i.e. that strategy of the Row player that maximizes her payoff if she expects that the Column player discovers her strategy and that the Column player's goal is to minimize the Row player's payoff.
 - (c) What is the highest payoff the Row player can guarantee for herself, i.e. the maxmin payoff?
 - (d) For each of the Column player's strategies, fix that strategy and find the corresponding strategy of the Row player that maximizes the Row player's payoff.
 - (e) Determine the Column player's minmax strategy, i.e. that strategy of the Column player that minimizes the Row player's payoff if the Column player expects that the Row player discovers her strategy and that the Row player's goal is to maximize the Row player's payoff.
 - (f) What is the lowest payoff of the Row player that the Column player can guarantee in the game, i.e. the minmax payoff?
 - (g) Do the minmax and the maxmin payoff coincide?
 - (h) Does the game have a minmax value?
 - (i) If the game has a minmax value, do the strategies that guarantee that value form a Nash equilibrium.
 - (j) Are there any dominated strategies in the game? Are they strictly or weakly dominated?

The payoffs in the payoff matrix are the row player's payoffs.

		Column		
		left	center	right
Row	up	1	2	3
	middle	4	5	6
	down	7	8	9

2. Firm A considers entering a market that is currently solely served by firm B. If firm A decides to stay out, then firm B continues to enjoy a profit of 10 (million dollars), and firm A's profit remains at zero. If firm A decides to enter the market, then firm B can either acquiesce to the entry or fight entry. If firm B acquiesces, then both firms share the market and each earns a profit of 5. If firm B fights entry, then firm A has two options: Firm A can decide to hold out in order to eventually acquire some market share, with a profit of 1 for firm A and a profit of 2 for firm B. Firm A can decide to cave in and leave the market with a profit of -1 for firm A and of 6 for firm B.
- Draw the corresponding game tree.
 - Solve the game by backward induction.
 - Find the strategic form representation of the game.
 - Find all Nash equilibria.
3. For the following game
- Suppose that the Row player fears that the Column player will discover the Row player's strategy. Can the Row player gain by adopting a randomized strategy? If not, why not? If so, why?
 - Suppose that the Column player fears that the Row player will discover the Column player's strategy. Can the Column player gain by adopting a randomized strategy? If not, why not? If so, why?

		Row	
		West	East
Column	Top	(13,-13)	(0,0)
	Bottom	(-11,11)	(13,-13)

4. In Philip K. Dick's Novel *The Solar Lottery*
- What device does the author use to implement the fear of an omniscient opponent that underlies maxmin reasoning?
 - Which player faces an omniscient opponent, and how does this player deal with his opponent's omniscience?
 - In what way is Philip K. Dick's literary treatment of zero-sum games an advance over Arthur Conan Doyle's treatment of such games?
 - Which game theorists informed Philip K. Dick's work and how do they appear in his novel?
 - Which physicist is mentioned in *The Solar Lottery* and what is the relation between his work and that of the game theorists mentioned in the novel?