

LP Assignment 6

DUE DATE: Monday, October 12 at 4:30pm in my department mailbox.

Please be sure to observe Dr. Martin's assignment presentation rules.

Provide neat and careful solutions to the following five problems:

1.) Consider the matrix game with payoff matrix

$$A = \begin{bmatrix} 0.5 & -2 \\ 1 & -3 \\ -4 & 2 \end{bmatrix}$$

Set up the LP formulation for Column Player's optimal strategy. Solve by the simplex method, showing each dictionary and each pivot.

2.) Consider the matrix game with payoff matrix

$$A = \begin{bmatrix} 4 & 0 & 4 & 8 & -3 \\ 0 & -2 & 4 & 6 & -4 \\ -6 & 2 & -6 & -8 & 1 \\ -4 & 3 & -4 & -4 & 1 \\ 0 & -4 & -3 & 3 & -4 \end{bmatrix}$$

First apply the domination technique to reduce the game (show your steps). Then find the value of the game and optimal strategies for each player.

3.) Consider the game of Morra with each player being able to display one to five fingers. If one player guesses the total number of fingers displayed and his opponent does not, then he wins that many points. With explanation, derive the full payoff matrix for this game and use MAPLE to find optimal strategies for each player.

4.) Find optimal strategies for Rock/Paper/Scissors where the payoff is one dollar if Rock or Scissors wins and m dollars if Paper wins, where m is a free parameter. (Note: the rules as to who wins are the same as in the traditional game. Only the amount to be paid is changed.) Is it still a fair game? [HINT: Use MAPLE to find optimal strategies for various

fixed values of m and then make a conjecture for general m . Verify your conjecture using the Minimax Theorem.]

5.) Playing on a 2×3 checkerboard, Row Player secretly chooses a square and writes it down. Column Player then places a domino on the board, exactly covering two adjacent squares. If the secret square gets covered, then Row Player wins one dollar; if the ship (domino) avoids the mine (secret square), then Column Player wins a dollar. Find the value of the game and optimal strategies for both players. Finally, extend your analysis to bigger checkerboards.