

10.4

Quick Notes

Two person Games – Any conflict or competition between two people.

- 1) If one player's loss is equal to the other player's gain in all circumstances, then it is called a zero sum game.
- 2) A game defined by a matrix is strictly determined if and only if there is an entry that is the smallest in its row and largest in its column. This entry is called the **saddle point** and is the value of the game.
- 3) In our class, player I will play rows and player II will play columns. A positive entry in a matrix denotes a gain to player I (and thus a loss to player II in a zero sum game).
- 4) A game with a positive value favors player I, a negative value favors player II. If the value of a game is 0, that game is fair.
- 5) The row containing the saddle point (if one exists) is the best strategy for player I, and the column containing the saddle point is the best strategy for player II.

Examples)

- 1) Is the zero sum game represented by the matrix strictly determined? If so, what is the value of the game, which player (if any) it favors and what is the best strategy for each player?

a) $\begin{bmatrix} 2 & -1 \\ -7 & -3 \end{bmatrix}$ b) $\begin{bmatrix} 2 & -1 \\ -7 & 3 \end{bmatrix}$ c) $\begin{bmatrix} -2 & 5 & -3 \\ 0 & 4 & 2 \\ -1 & -6 & 3 \end{bmatrix}$ d) $\begin{bmatrix} 5 & 1 & 6 \\ 3 & 2 & 4 \end{bmatrix}$

- 2) Billy and Mandy are playing a betting game. They will each write down one of the numbers, 1, 2, or 3 (without looking at the others. When they show each other, if the sum of the numbers is even, Billy pays Mandy that number of pennies. If the sum is odd, Mandy pays Billy that number of pennies.

- a) Let Billy be player I. Make the matrix that represents this game. (keep the numbers in order)
- b) Is the game strictly determined? If so, what is the value of the game, , which player (if any) it favors and what is the best strategy for each player?