Mathematical Introduction to Game Theory

Assignment 3, due October 2

Problem 1 of 5. Consider a zero-sum game with the matrix

$$\begin{pmatrix} 0 & 1 & 1 & 0 \\ -1 & 0 & 2 & 0 \\ 1 & -2 & 0 & -1 \\ -2 & 0 & 0 & 1 \end{pmatrix}.$$

Find Chris' optimal response to the $(\frac{1}{3}, \frac{1}{4}, \frac{1}{4}, \frac{1}{6})$ strategy of Ruth.

Problem 2 of 5. Solve the following zero-sum game, i.e. find the value of the game and all optimal strategies for both players

$$\begin{pmatrix} -1 & 5 \\ 8 & 2 \end{pmatrix}.$$

Problem 3 of 5. Consider a zero-sum game with the matrix

$$\begin{pmatrix} 0 & 1 & 1 & a \\ -1 & 0 & 2 & 0 \\ 1 & -2 & 0 & -1 \\ -2 & 0 & 0 & -2 \end{pmatrix}$$

where a is a parameter. For which values of a does the game have saddle point?

Problem 4 of 5. Solve the following zero-sum game, i.e. find the value of the game and all *pure* optimal strategies for both players

$$\begin{pmatrix} 1 & 1 & 2 & 1 \\ 0 & 0 & 2 & 0 \\ 1 & 1 & 5 & 8 \\ 0 & 1 & 0 & 3 \end{pmatrix}.$$

Problem 5 of 5. Find all the values of x for which the game with the matrix

$$\begin{pmatrix} -x & 2\\ -1 & x \end{pmatrix}$$

has a strictly positive value.