

## Mathematics 121 – Game Theory

### Homework Assignment No. 5

1. In the game of matching pennies, each player has two strategies, “heads” and “tails”. If both players choose identical outcomes (both “heads” or both “tails”), then the first player wins. In all other cases, the second player wins.
  - a. Represent this game as a bimatrix game.
  - b. Show that this game has no equilibrium that consists of pure strategies.
  - c. Find all mixed strategies for both players.
  - d. Find all equilibria in the collection of all mixed strategies.
2. Find all equilibria with respect to definitions A and B for the bimatrix game  $(A_1, A_2)$ , if

$$A_1 = A_2 = \begin{pmatrix} 5 & 1 & 3 \\ 3 & 2 & 4 \\ -3 & 0 & 1 \end{pmatrix}$$

3. A bimatrix game  $(A_1, A_2)$  is given by the following matrices:

$$A_1 = \begin{pmatrix} 2 & 3 \\ 5 & 2 \end{pmatrix}$$

$$A_2 = \begin{pmatrix} 3 & 2 \\ 0 & 3 \end{pmatrix}$$

Find all equilibria with respect to definitions A and B.

4. Find a bimatrix game  $(A_1, A_2)$  that has at least one equilibrium with respect to definition A and no equilibrium with respect to definition B.
5. A bimatrix game  $(A_1, A_2)$  is given by the following matrices:

$$A_1 = \begin{pmatrix} 2 & 3 \\ 5 & 2 \end{pmatrix}$$

$$A_2 = \begin{pmatrix} -2 & -3 \\ -5 & -2 \end{pmatrix}$$

- a. Show that this game has no equilibrium that consists of pure strategies.
- b. Find all mixed strategies for both players.
- c. Find all equilibria in the collection of all mixed strategies.