

# Mathematical Introduction to Game Theory

## Assignment 7, due November 22

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**Problem 1 of 5.** Find the point of the optimal agreement for the two-person cooperative TU game given by the following bi-matrix.

$$\begin{pmatrix} (2, 0) & (5, 5) & (2, 1) & (10, 9) & (8, 8) \\ (4, 4) & (5, 4) & (3, 3) & (2, 1) & (3, 2) \\ (2, 3) & (0, 0) & (1, 1) & (4, 5) & (6, 4) \\ (-1, 0) & (9, 8) & (5, 6) & (3, 2) & (2, 2) \end{pmatrix}$$

**Problem 2 of 5.** Consider a two-person cooperative game given by the following matrix

$$\begin{pmatrix} (2, 0) & (3, -3) & (2, -1) & (10, -9) & (0, 0) \\ (7, 5) & (3, 1) & (3, 2) & (2, 1) & (-1, 2) \\ (2, 3) & (0, 0) & (1, 1) & (4, 5) & (-1, 4) \\ (-1, 0) & (8, 7) & (5, 6) & (3, 2) & (-1, 5) \end{pmatrix}.$$

Solve the game as a TU game.

**Problem 3 of 5.** Find the Nash solution of the game from a previous problem played as an NTU game with disagreement point  $(0, 0)$ .

**Problem 4 of 5.** Sometimes it appears a player would prefer to play a game without cooperating with the other player. The payoff matrix for a two-person non-zero-sum game is:

$$\begin{pmatrix} (3, 8) & (4, 4) \\ (2, 0) & (0, 6) \end{pmatrix}.$$

Find all its equilibrium pairs when considered as a non-cooperative game. Then find the solution of the game considered as a TU cooperative game. Which game would II prefer to play?

**Problem 5 of 5.** Find the NTU-solution and the equilibrium exchange rate of the following game without a fixed threat point.

$$\begin{pmatrix} (3, 8) & (4, 4) \\ (4, 0) & (0, 6) \end{pmatrix}.$$