

AGTA Tutorial Sheet 1 (Week 3)

Please attempt these questions before coming to the tutorial on Tuesday.

1. Consider the following 2-player finite strategic form game, G :

$$\begin{bmatrix} (7, 3) & (6, 3) & (5, 5) & (4, 7) \\ (4, 2) & (5, 8) & (8, 6) & (5, 8) \\ (6, 1) & (3, 8) & (2, 4) & (6, 9) \end{bmatrix}$$

This is a “bimatrix”, to be read as follows: Player 1 is the row player, and Player 2 is the column player. If the content of the bimatrix at row i and column j is the pair (a, b) , then $u_1(i, j) = a$ and $u_2(i, j) = b$.

- (a) Consider the mixed strategies $x_1 = (1/4, 1/2, 1/4)$ and $x_2 = (2/3, 1/3, 0, 0)$, for player 1 and 2, respectively. Here, e.g., player 1 is playing row 2 with probability $1/2$, etc.

What is the *expected payoff* to Player 1 under profile $x = (x_1, x_2)$?

- (b) Using what you have learned in lectures, see if you can compute *all* the Nash Equilibria (pure or mixed) of game G .

2. Consider the 2-player zero-sum game given by the following payoff matrix, A , for Player 1:

$$A = \begin{bmatrix} 4 & 2 & 9 & 2 & 5 \\ 6 & 3 & 5 & 9 & 7 \\ 1 & 4 & 8 & 5 & 7 \\ 5 & 1 & 3 & 5 & 6 \end{bmatrix}$$

Specify the linear programming problem you could use to “solve” this game, meaning to compute the minimax value of this game, and to compute a minmaximizer strategy for Player 1. What if you wanted to compute also a maximizer strategy for Player 2?

Next, try to actually compute the minimax value of this game (hint: first simplify the game to the extent possible).