

MP305 Practical 2022/2023 – Game Theory

- The Python notebook `Game_Theory` that can be accessed via any web browser. See the **MP305 Blackboard** web page for details and instructions.
- Solutions to **all** questions with (*) have to be submitted as a pdf document through Blackboard. You must include some text commentary (in Python notebook Markdown cells) to explain your answers to the questions asked.
- This practical is worth 3% of your final grade.

1. (*) Analyse the following matrix games and determine whether or not a saddle point solution exists.

(a)

	B_1	B_2
A_1	1	2
A_2	0	-2

(b) The two coin game:

	B_1	B_2
A_1	1	-1
A_2	-1	1

(c)

	B_1	B_2	B_3	B_4
A_1	1	2	4	0
A_2	0	-2	-3	4

(d)

	B_1	B_2	B_3	B_4
A_1	1	0	4	1
A_2	-1	-4	-3	4

(e) The game of "odd-even":

	B_1	B_2	B_3
A_1	0	2	-1
A_2	-2	0	3
A_3	1	-3	0

(f)

	B_1	B_2	B_3	B_4
A_1	0	13	-5	1
A_2	-13	0	8	-12
A_3	5	-8	0	6
A_4	-1	12	-6	0

2. (*) Analyse the previous games (c) and (d) where A has two strategies A_1 and A_2 chosen with probability p and $1 - p$ respectively.
- (a) Find the average payoff $U_j(p)$ against strategy B_j for each $j = 1, \dots, n$.
 - (b) Find the optimal choice of p by diagrammatic means.
 - (c) Find two strategies that B must play to minimize their loss.
 - (d) Find the optimal mixed strategy for B .