IA168 — Problem set 1

Problem 1 [5 points]

Consider a **zero-sum** two-player strategic-form game with **pure** strategies only, where each player has exactly four strategies, called A_1, B_1, C_1, D_1, and A_2, B_2, C_2, D_2, respectively. Define the utility function of this game so that for both $i \in \{1, 2\}$, all of the following conditions are satisfied:

- the strategy A_i of player i is strictly dominated;
- the strategy B_i of player i is never-best-response, but not strictly dominated;
- the strategy C_i of player i is not never-best-response;
- (D_1, D_2) is the only Nash equilibrium of the game.

Problem 2 [7 points]

Consider a two-player strategic-form game with **mixed** strategies, where each player has exactly two pure strategies, called A_1, B_1, and A_2, B_2, respectively. The utility functions are defined by the following table:

	A_2	B_2
A_1	$(a, 4)$	$(-a, 2)$
B_1	$(3, 1)$	$(1, 3)$

In dependence on the parameter $a \in \mathbb{R}$, find all Nash equilibria of this game, and for each of them, decide whether it is Pareto-optimal.

Problem 3 [8 points]

Prove or disprove the following two propositions: In every strategic-form game with **pure** strategies only, it holds that:

a) every rationalizable equilibrium is a Nash equilibrium;

b) every Nash equilibrium is a rationalizable equilibrium.