IA168 — Problem set 1

Problem 1 [4 points]

Give an example of a **zero-sum** two-player strategic-form game G with **pure** strategies only such that $G \neq G^1_{Rat} \neq G^2_{Rat} \neq G^3_{Rat}$.

Problem 2 [8 points]

Consider a two-player strategic-form game with **mixed** strategies, where each player has exactly two strategies, called A_1, B_1, and A_2, B_2, respectively.

a) Define the utility functions of both players so that there are infinitely many mixed Nash equilibria, but there are $\bar{\sigma}_1 \in \Sigma_1, \bar{\sigma}_2 \in \Sigma_2$ such that for all $\sigma_1 \in \Sigma_1, \sigma_2 \in \Sigma_2$ neither $(\bar{\sigma}_1, \sigma_2)$ nor $(\sigma_1, \bar{\sigma}_2)$ is a mixed Nash equilibrium.

b) Define the utility functions of both players so that there are as many mixed Nash equilibria as possible, but only finitely many of them.

c) Prove that, provided there are only finitely many mixed Nash equilibria, there cannot be more of them than in your example from b).

Problem 3 [8 points]

Prove or disprove:

a) IESDS creates no new Nash equilibria in any finite strategic-form game G with pure strategies.

b) IESDS creates no new Nash equilibria in any strategic-form game G with pure strategies.