Econ/CS 272/166B Winter 2020
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Problem Set #4

Due in class Tuesday February 4. Each group turns in a single copy. Give credit for which group members took the lead in solving the problem, and in writing it up.

1. Prove that every payoff matrix for a single population game has the same continuous dynamics as a "normalized" payoff matrix with zeros along the main diagonal. See the bottom of p.124 of the text for a hint.

2. Consider the fitness matrix for a single population with 3 alternative strategies:
   w =

0	1	2
2	0	2
1	3	0

   a. Find the three delta functions algebraically and sketch their nullclines (e.g., $\Delta w_{1\text{-}2} = 0$) in barycentric coordinates.
   b. Sector the simplex and indicate possible directions of adjustment for sign-preserving dynamics.
   c. Find all steady states and identify them as sinks, sources, saddles, etc from b, and sketch the basins of attraction for the sinks.
   d. Which of these steady states are Nash equilibria? Evolutionary equilibria?
   e. Assume replicator dynamics. Use eigenvalue or other convenient analytic techniques to check whether each equilibrium has the same stability status (e.g., sink or saddle) as with the sign preserving dynamics.

3. Update the prospectus for your group project. Have you refined your research question? Again specify the strategic interaction including the player population(s), the alternative strategies and the payoff function. Explain how you plan to proceed with your analysis, naming major references you will use.