

MIT 14.11: Problem Set 1
Fall 2013

Due in class on Tuesday, September 24th. If you are working with a partner, you and your partner may turn in a single copy of the problem set. Please show your work and acknowledge any additional resources consulted.

1. Hawk-Dove.

- (a) Two animals are fighting over some resources which gives them benefit v . Each can be a dove (passive) or a hawk (aggressive). Each prefers to be aggressive if its opponent is passive and passive if its opponent is aggressive. Given its own stance, it prefers the outcome in which its opponent is passive to that in which its opponent is aggressive. If both are aggressive, both animals incur cost $-c$. Write down the payoff matrix presented in lecture and find all pure Nash equilibria.
- (b) Hawk-Dove-Bourgeois.
Suppose a new strategy becomes available to the players of the Hawk-Dove dove game. We will call the strategy “Bourgeois.” The Bourgeois strategy says that the player who arrived first will play like a Hawk, while the player who arrived second will play like a Dove. When two players are matched, it is randomly determined who arrived first between them. Write down the payoff matrix for this modification of the Hawk-Dove game and find all pure Nash equilibria. Do they differ from the Nash equilibria of the Hawk-Dove game without Bourgeois?

2. Rock Paper Scissors.

- (a) The game, “Rock, Paper, Scissors,” which you have played since grade school, can be analyzed in this framework. In case you have forgotten, two players simultaneously choose to play “Rock”, “Paper” or “Scissors”. Rock beats Scissors, Scissors beats Paper, and Paper beats Rock. Suppose the “winner” of each game wins one point while the loser loses a point. Write down the payoff matrix that defines this game and find all pure or mixed strategy Nash equilibria.
- (b) Perturbed Rock Paper Scissors.
Now suppose that the loser of each round loses two points instead of one. Write down the payoff matrix that defines this perturbed Rock Paper Scissors game and find all pure or mixed strategy Nash equilibria.

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14.11 Insights from Game Theory into Social Behavior

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