Game Theory: Algorithms and Applications
CS 539

Fall 2019
HomeWork 2
Due September 20th, 11:59pm
Total: 100 points

1. Suppose there are two players, each choosing an integer, say x_1 and x_2, respectively. If $x_2 \leq x_1 \leq 3x_2$ then player 1 gets \$1 from player 2. The reverse is true when $x_1 \leq x_2 \leq 3x_1$. Determine a mixed strategy Nash Equilibrium.

2. Co-ordination Game: 2 players attempt to co-ordinate efforts to solve a problem. Their strategy set is $\{Slack, Effort\}$. The pay-off matrix is provided below:

Table 1: Battle of Sexes

Payoff	Slack-off	Effort
Slack-off	$(0, 0)$	$(0, -c)$
Effort	$(-c, 0)$	$(1-c, 1-c)$

   Find all the mixed strategy Nash Equilibria of this game. How do the equilibria change as c changes.

3. Consider the *hot-potato routing*/coordination routing game discussed in class. Find a mixed equilibrium of that game.

4. Consider the two-player Rock/Paper/Scissors (strategic) game. Remember that the game has the following rule: Rock beats Scissors, Paper beats Rock and Scissors beats paper. The winning player receives \$ 10 from the loser. A tie results in zero gain for both players. Find a mixed Nash equilibrium in this game.