

## MATH 1150 Homework Assignment 3

**Show your work!!!**

**1.** Solve the following zero-sum matrix games. Your final answer should include the value  $v$  of the game and (possibly mixed) strategies for Colin and Rose so that Colin's (possibly mixed) strategy guarantees an expected payoff of  $\leq v$  no matter what Rose does, and so that Rose's (possibly mixed) strategy guarantees an expected payoff of  $\geq v$  no matter what Colin does. Remember to try repeatedly deleting dominated strategies and/or looking for saddle points BEFORE trying the more complicated methods!

(a)

|   |    |    |
|---|----|----|
|   | A  | B  |
| A | -4 | 0  |
| B | 0  | -1 |
| C | 1  | 2  |
| D | 0  | 3  |

(b)

|   |    |    |   |   |
|---|----|----|---|---|
|   | A  | B  | C | D |
| A | 4  | -8 | 1 | 3 |
| B | -2 | 2  | 1 | 3 |
| C | -3 | -4 | 0 | 5 |

**2.** The game of Boulder-Paper-Machete is played just like Rock-Paper-Scissors (Rock beats Scissors, Scissors beat Paper, Paper beats Rock, and if both players play the same object, they tie), but with a twist: winning with either Boulder (vs. Machete) or Machete (vs. Paper) is worth two points, whereas winning with Paper is worth only one point.

(a) Write the payoff matrix for this  $3 \times 3$  game.

(b) Solve this game by using the method of equalizing expectations/expected payoffs. (Again, give the value and each player's optimal mixed strategies)

(c) You're playing Boulder-Paper-Machete against a person who isn't in our course, and you suspect that they're not playing optimally. You've played 15 times, and they've played  $P, P, M, B, M, M, P, P, B, B, B, M, P, B, M$ . Based on this information alone, if you had to guess their mixed strategy, what do you think it might be?

(d) Based on your answer to (c), what play next turn gives you the maximal expected payoff: Boulder, Paper, or Machete?