Solutions to homework #3 (1) First game: a (2,2) (0,0) b [0,0 [,1] See pages 62-63 in your book for more information Pure strategy NE: (a,c) and (b,d) Computing the mixed strategy NE: -We compute the point at which the row player is indifferent between its actions. Let g be the probability that the column player plays c U(a) = 2q + 0(1-q)=2q U(a) is the expectal |V(a)| = 0q + |V(a)| = 1-q payoff for playing a U(b) = 08 + 1(1-8)=1-8 Set U(a) = U(b) and solve for g  $2q = 1-q = q = 13 \rightarrow \text{the row play is indifferen:}$ between actions a + b when g= 1/3 We do the same thing for the column player, and get the same answer in this case since the game is symmetric Now check if either player has incentive to deviate when the other player plays the indifferent strategy > compare the pure strategies against the indifferent strategy process is  $U((\frac{1}{3}, \frac{2}{3}), (\frac{1}{3}, \frac{2}{3}) = (\frac{1}{3})(\frac{1}{3})^2 + (\frac{1}{3})(\frac{2}{3})^2 + (\frac{2}{3})(\frac{1}{3})^2 + (\frac{2}{3})(\frac{2}{3})^2 +$ the some both for players  $U(1,0), (\frac{1}{3},\frac{2}{3}) = 1(\frac{1}{3})(2) + 1(\frac{2}{3})0 + 0(\frac{1}{3})0 + 0(\frac{2}{3})0 = \frac{3}{3}$  $U(0,1),(\frac{1}{3}1\frac{2}{3}))=O(\frac{1}{3})2+O(\frac{2}{3})0+I(\frac{1}{3})0+I(\frac{2}{3})1=\frac{2}{3}$ 

All utilities are the same so agents don't have incentive to deviate from their stategy that makes the other player indifferent Mixed NE: (1/3, 3/3), (1/3, 2/3)

CIS 603 Homework #3 cont.

Second game: a (4,4) 0,3 b (3,0) (2,2)

Pure-strategy NE: (a,a) and (b,b)

Compute the mixed strategy NE:

Find point of indifference for the row and column players (the same for both players since the game is symmetric) Let q be the probability that col plays a

U(a) = 4a + D(1-a) - 4a

V(a) = 4g + O(1-g) = 4gV(b) = 3g + Z(1-g) = 3g + Z - Zg = g + Z

Set U(a) = U(b) and solve for 8

4g=g+2 ⇒ g= 2/3 → the row player is indifferent

between actions a and b when

the column player plays a

with probability 2/3

Do the same for the column player

You can verify as in the previous game that: (2/3,1/3)(23,1/3) is a NE > no player can benefit by unilaterally changing its strategy.

(2) Compare NE w/ maximin strategies

(13,2/3)
The maximin strategy pairs form the mixed strategy
NE in this game

B) Second game always play b: (0,1)

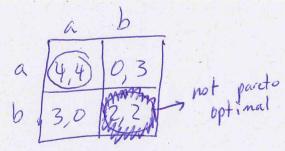
The maximin strategy pairs form the pure strategy NE of (b,b)

In general, the maximin strategy pairs is not greated to be a NE, though it is in this game.

I The maximin strategy pairs do form to the point of the unique NE in constant-som games, however.

3) The pareto optimal solutions are circled in each game

a (2,2)0,0b (0,0)1,1



This answer is subjective, but you should have shown that you actually thought about it.