Week9hw609

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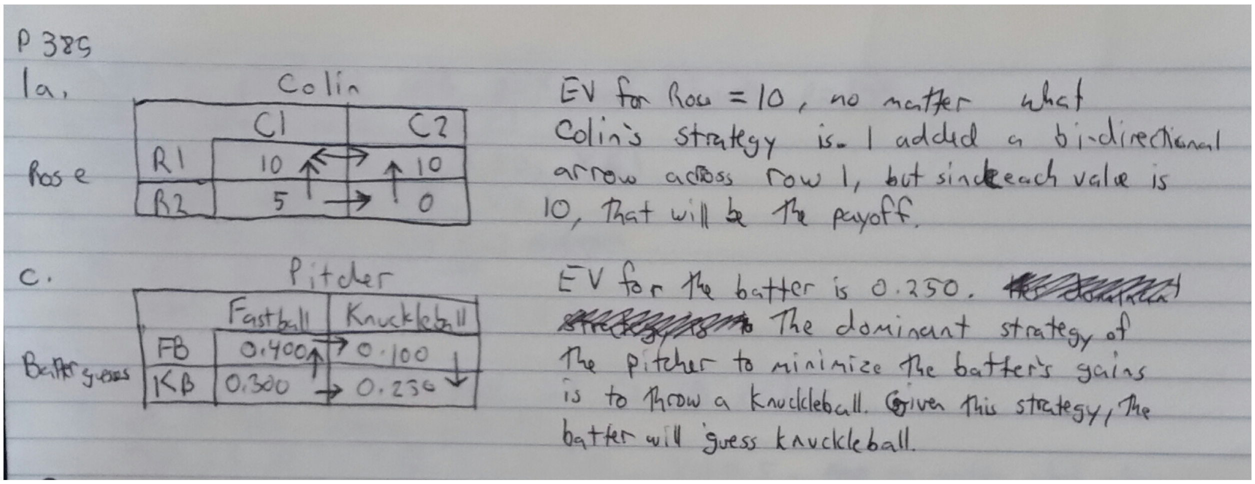
Page 385, 1a and 1c

Using the definition provided for the movement diagram, determine whether the following zero-zum games have a pure strategy Nash equilibrium. If the game does have one, state the Nash Equilibrium. Assume the row player is maximizing his payoffs which are shown in the matrices below.



P 385

1a.

		Colin	
		C1	C2
Rose	R1	10	10
	R2	5	0

EV for Rosa = 10, no matter what Colin's strategy is. I added a bi-directional arrow across row 1, but since each value is 10, that will be the payoff.

c.

		Pitcher	
		Fastball	Knuckleball
Batter guess	FB	0.400	0.100
	KB	0.300	0.250

EV for the batter is 0.250. The dominant strategy of the pitcher to minimize the batter's gains is to throw a knuckleball. Given this strategy, the batter will guess knuckleball.

1a. EV for Rosa = 10, no matter what Colin's strategy is. I added a bidirectional arrow across row 1, but since each value is 10, that will be the payoff.

1c. EV for the batter = 0.25. The dominant strategy of the pitcher to minimize the batter's gains is to throw a knuckleball. Given this strategy, the batter will guess a knuckleball.

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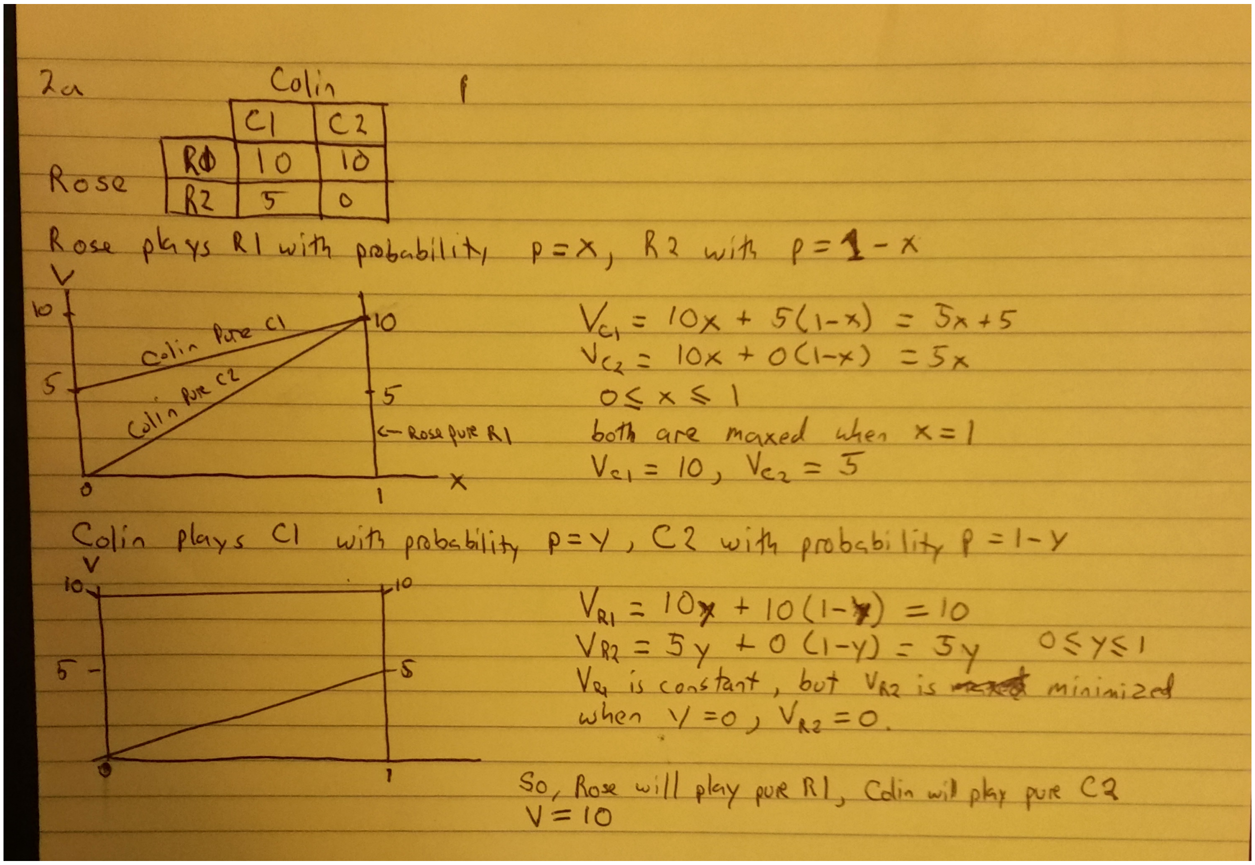
Build a linear programming model for each player's decisions and solve it both geometrically and algebraically. Assume the row player is maximizing their payoffs which are shown in the matrices below.



2a

		Colin	
		C1	C2
Rose	R1	10	10
	R2	5	0

Rose plays R1 with probability $p = x$, R2 with $p = 1 - x$

$V_{C1} = 10x + 5(1-x) = 5x + 5$
$V_{C2} = 10x + 0(1-x) = 5x$
$0 \le x \le 1$
both are maxed when $x = 1$
$V_{C1} = 10$, $V_{C2} = 5$

Colin plays C1 with probability $p = y$, C2 with probability $p = 1 - y$

$V_{R1} = 10\cancel{x} + 10(1-\cancel{x}) = 10$
$V_{R2} = 5y + 0(1-y) = 5y$ $\quad 0 \le y \le 1$
V_{R1} is constant, but V_{R2} is ~~maxed~~ minimized when $y = 0$, $V_{R2} = 0$.

So, Rose will play pure R1, Colin will play pure C2
$V = 10$

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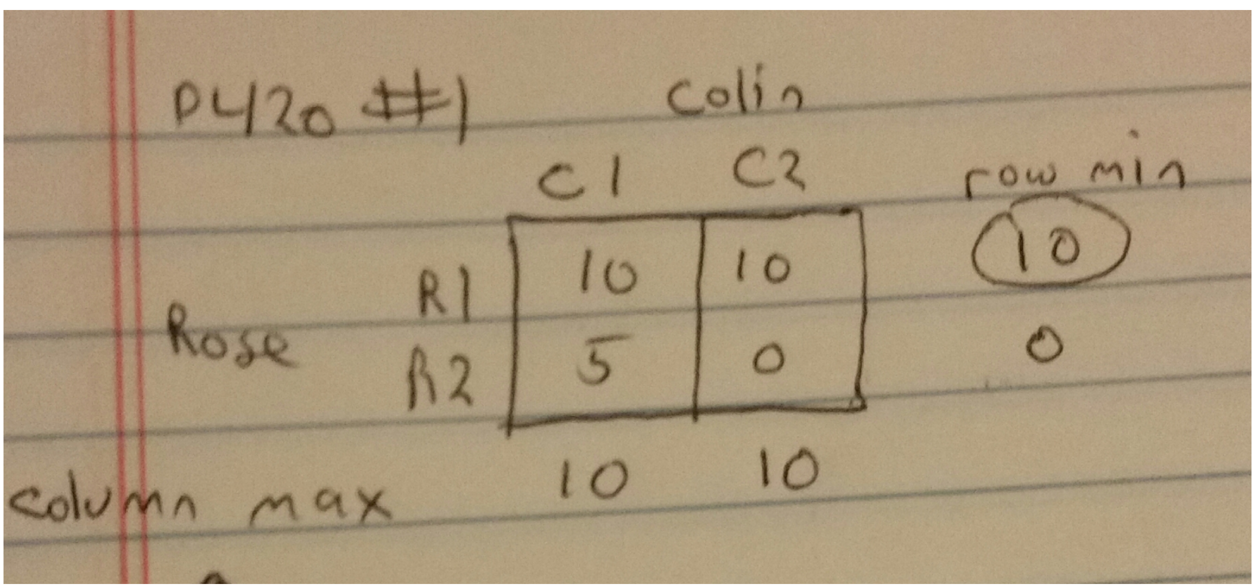
We solved this earlier using arrows, which showed that Colin will pay C2 and Rosa will play R1. Lets see what happens when we try maximin-minimax:



P420 #1

		Colin		
		C1	C2	row min
Rose	R1	10	10	10
	R2	5	0	0
column max		10	10	

Looks like this solution leaves Colin's strategy open. the payoffs are both 10, and there is no minimax. Either way Rose will end up with 10.

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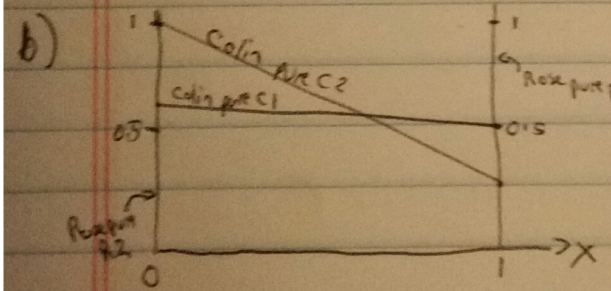
p 428 #3

a)

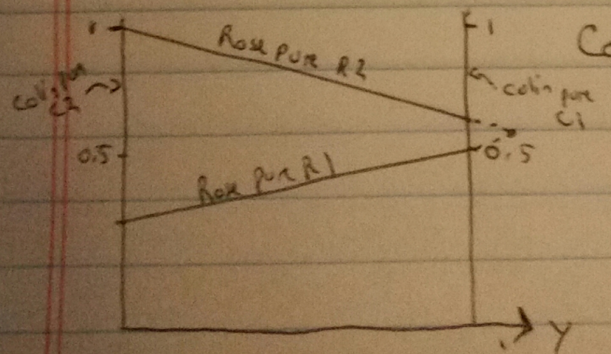
		Colin C1	Colin C2
Rose	R1	0.5 →	0.3
Rose	R2	0.6 ←	1

There is a pure strategy equilibrium at R2 and C1, so we don't need to set the expected values equal to eachother to solve.

b)



Rose's game - play R1 with p=x



Colin's game - play C1 with p = y

This has a pure strategy solution, so none of the solutions in this section will work. In part b, you'll see the intersection point of Colin's strategies happening outside of the constraints.

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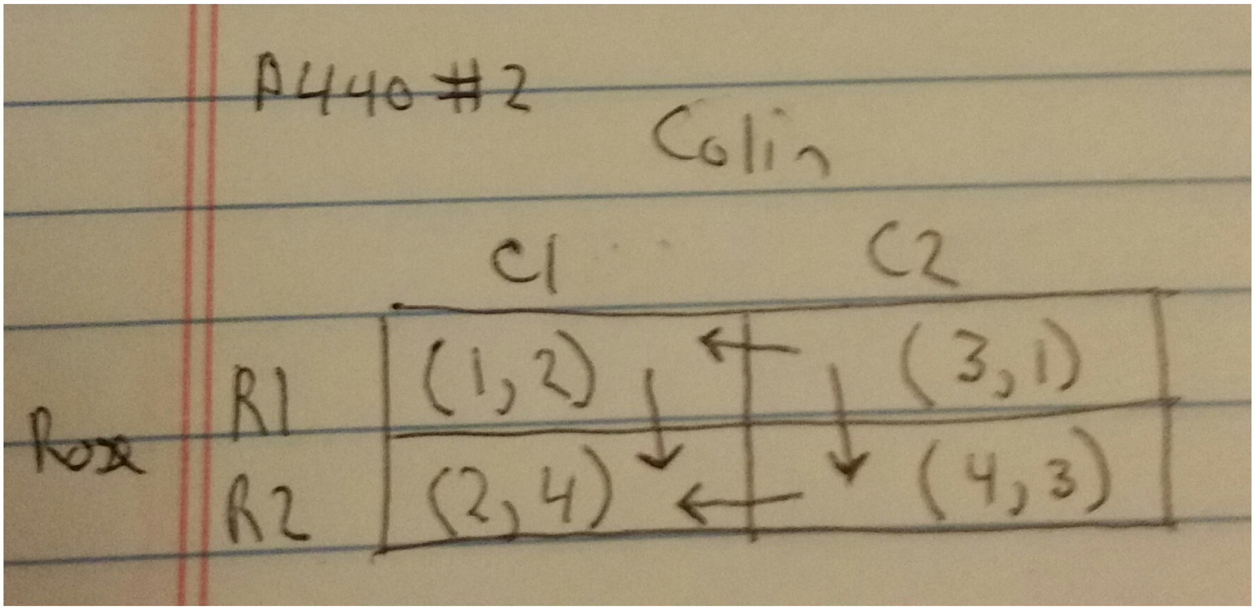

This game has a Nash equilibrium at R2 and C1, with Colin getting 4 and Rose getting 2.

Rose would rather Colin choose C2. If Colin chose C2, Rose would end up with 4, but Colin would only end up with 3. Without any changes in incentives, no promises or threats would induce Colin to choose C2.

The combined payoff in C2,R2, however, is higher. If Rose agreed too give Colin part of her payoff, she could perhaps strike a bargain. If these are dollar amounts being received, for example, and this is a repeating game, Rose could agree to give Colin alternating amounts of $1 or $2 if he chooses C2. The repeat nature of the game allows both players to “split” that extra value when Colin plays C2. Over time, Colin’s expected payoff could be greater than 4, inducing him to choose C2 and let Rose have an expected payoff greater than 2.