Week 9: Game theory IS609

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

			Colin
		C1	C2
Rose	R1	10	10
	R2	5	0

Rose uses strategy R1 and R2 to maximize her payoff, Colin uses strategy C1 and C2 to minimize his loses. Rose wins only if Colin loses. Rose plays R1, Colin plays C1 or C2 for Rose to win. The value of the game is 10. This game is pure strategy and follows Nash Equilibrium.

			Pitcher
		Fastball	Knuckleball
Batter	Guesses fastball	.400	.100
	Guesses knuclkeball	.300	.250

The strategy is Batter guesses a fastbass and hits it gast and expects a knuckleball and hits it. When the batter guesses a knuckleball, the pitcher throws a knuckleball for the batter to score. The value of the game is .250. This game is a strategy game and follows the Nash Equilibrium. Nash Equilibrium is an outcome where neither player can benefit by departing from the strategy associated witht he outcome.

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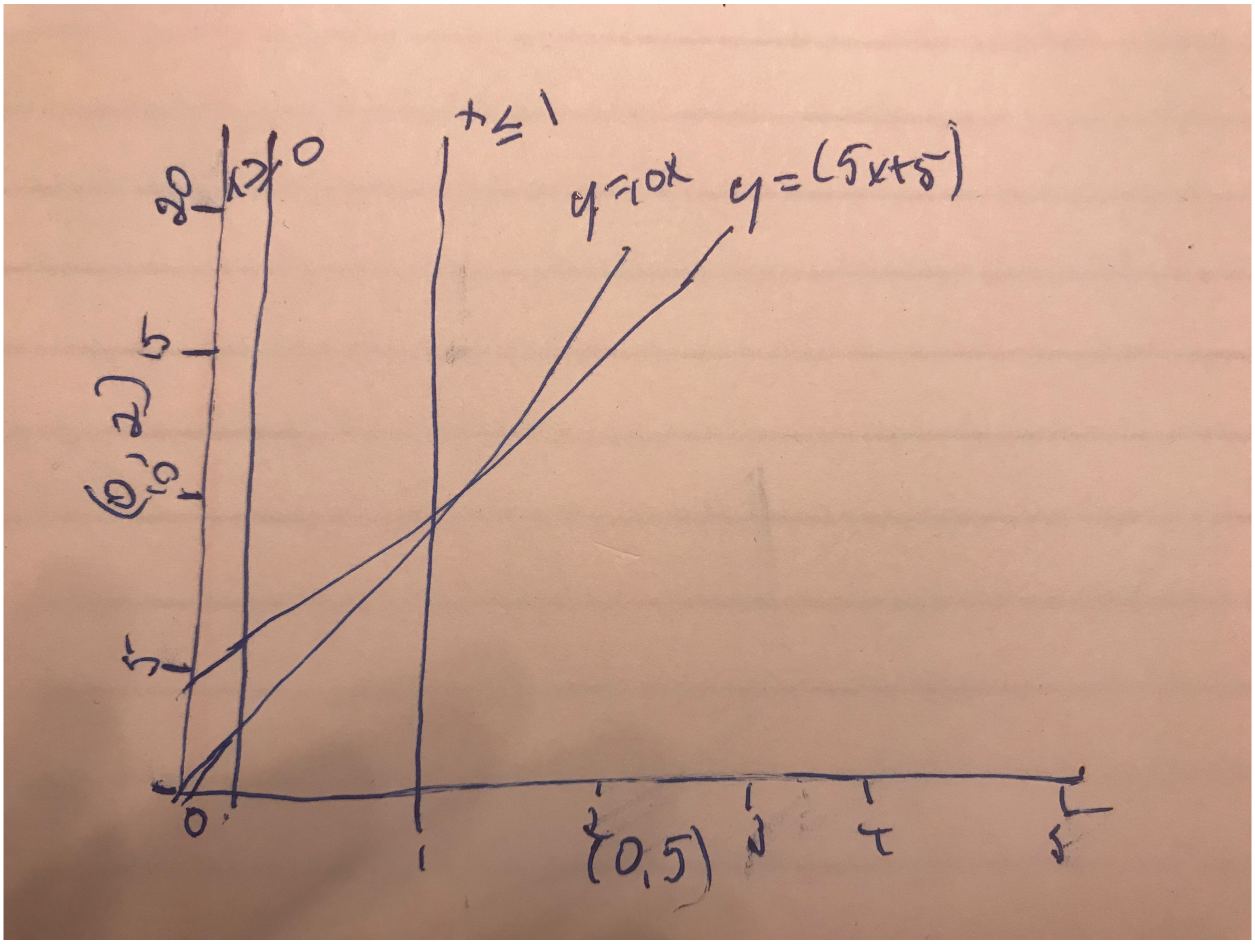
For problems a–g build a linear programming model for each player's decisions and solve it both geometrically and algebraically. Assume the row player is maximizing his payoffs which are shown in the matrices below.

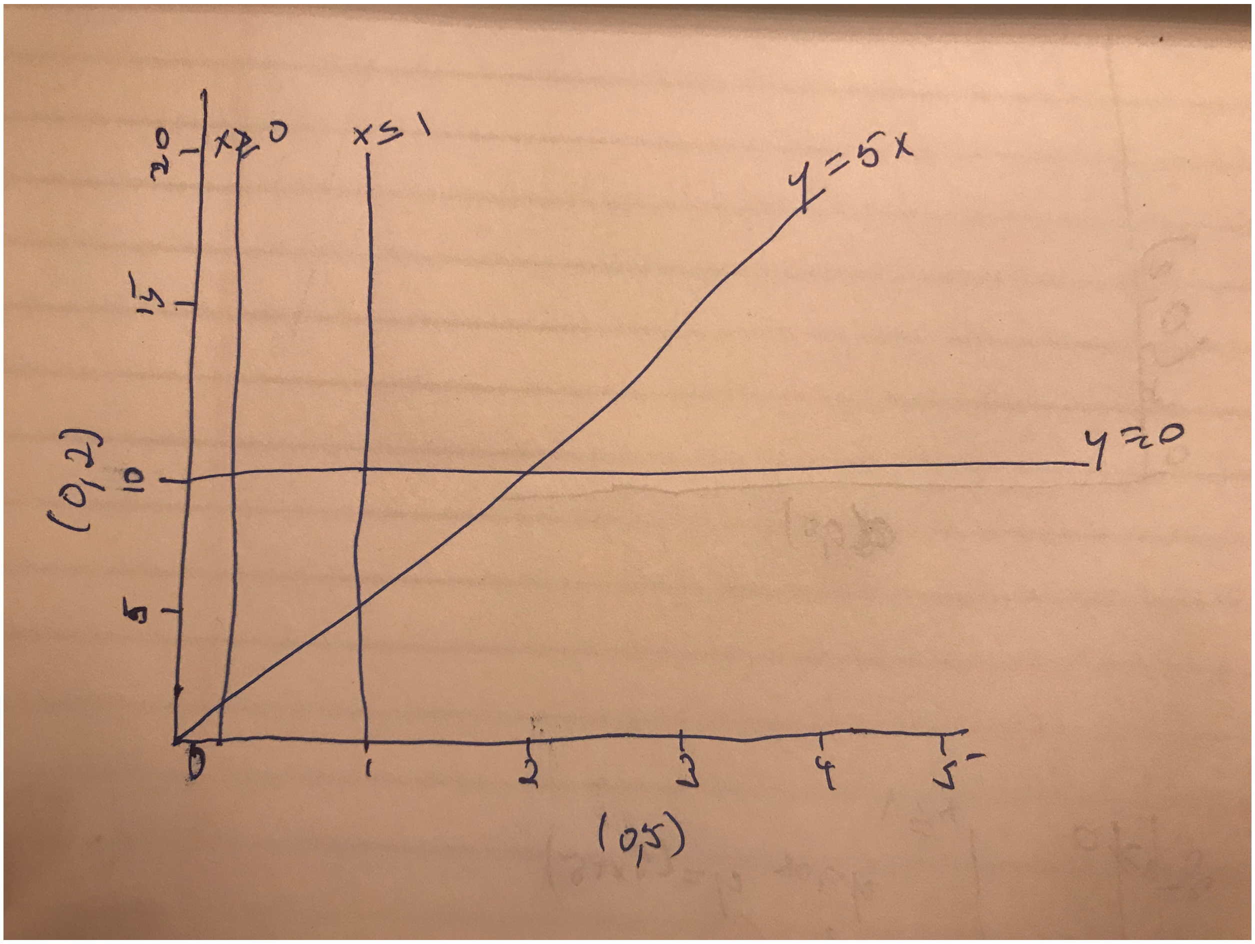
			Colin
		C1	C2
Rose	R1	10	10
	R2	5	0

Maximize Rose $A \leq 5x + 5$
$A \leq 10x$
$x \geq 0$
$x \leq 1$

Colin $A \leq 10x + 5(1 - x)$
$= 10x + 5 - 5x$
$A \leq 5 + 5x$
$A \leq 10x + 0(1 - x)$
$x \geq 0, x \leq 1$



Algebraically When $5x + 5 = 10x, x = 1$



Colin guesses $C11 - y$

Objective function: Minimize $A \leq 10y + 10(1 - y)$
$A \leq 10$
$A \leq 5y + 0(1 - y)$
$A \leq 5y$
$y \geq 0$

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In the following problems, use the maximin and minimax method and the movement dia- gram to determine if any pure strategy solutions exist. Assume the row player is maximizing his payoffs which are shown in the matrices below.

			Colin
		C1	C2
Rose	R1	10	10
	R2	5	0

Maximum Minimum

		Colin		
		C1	C2	Max(Row/Minimum)
Rose	R1	10	10	10
	R2	5	0	0
Min(Column/Maximum)	10	10		

The maximum value is 10 and the minimax value is 10 − both values are the same, the saddle point is 10. Rose's winning strategy is R1, with Colin's strategy being either C1 or C2

The value 10 has no arrow directly exiting – the position of neither play can unilaterally improve, it is an equilibrium point and follow a pure strategy.