HW3

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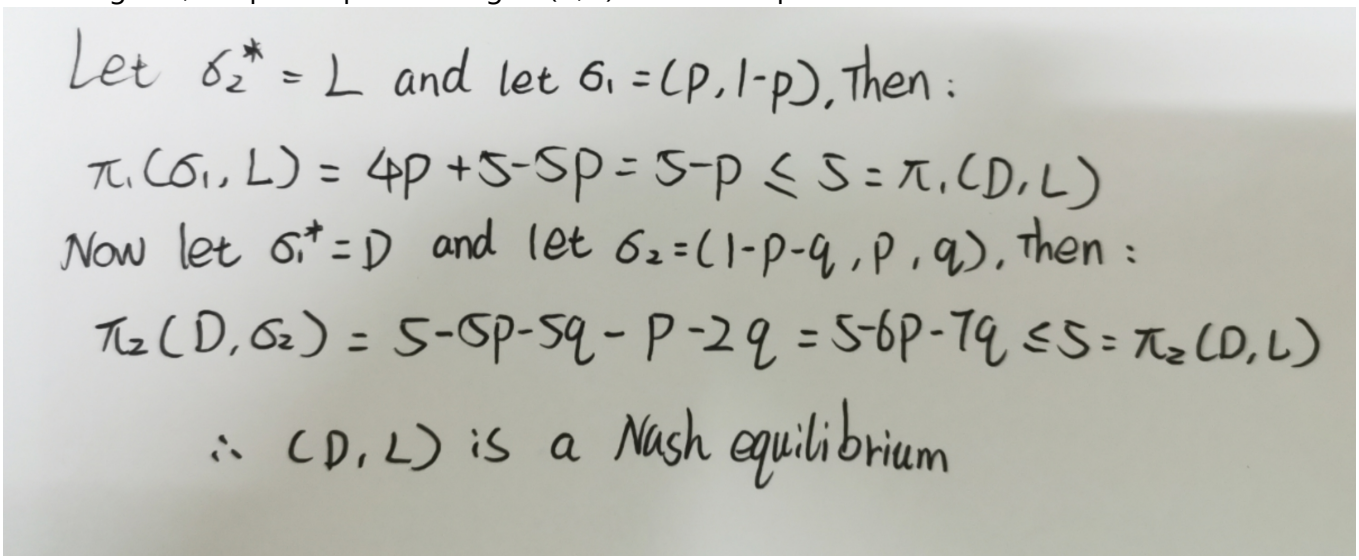
Exercise 4.5

		P_2		
		L	M	R
P_1	U	$4,3$	$2,7$	$0,4$
	D	$5,5$	$5,-1$	$-4,-2$

For this game, the pair of pure strategies (D, L) is a Nash equilibrium :



Exercise 4.7

Consider the children's game "Rock-Scissors-Paper", where 2 children simultaneously make a hand sign corresponding to one of the three items. Playing "Rock" (R) beats "Scissors" (S),"Scissors" beats "Paper" (P), and "Paper" beats "Rock". When both children play the same action (both R, both S, or both P) the game is drawn.

(a) Construct a payoff table for this game with a payoff of +1 for a win, −1 for losing, and 0 for a draw.
(b) Solve this game.

(a) The payoff table:

P_2 \ P_1	R	S	P
R	0,0	-1,+1	+1,-1
S	+1,-1	0,0	-1,+1
P	-1,+1	+1,-1	0,0

(b) suppose P_2 plays (R, S, P) with $(p, q, 1-p-q)$

If P1 is playing a completely mixed strategy at the Nash equilibrium, then:

$$\pi_1(R, \sigma_2^*) = \pi_1(S, \sigma_2^*) = \pi_1(P, \sigma_2^*)$$

$$\Leftrightarrow p\pi_1(R,R) + q\pi_1(R,S) + (1-p-q)\pi_1(R,P)$$
$$= p\pi_1(S,R) + q\pi_1(S,S) + (1-p-q)\pi_1(S,P)$$
$$= p\pi_1(P,R) + q\pi_1(P,S) + (1-p-q)\pi_1(P,P)$$

$$\Leftrightarrow q - 1 + p + q = -p + 1 - p - q = p - q$$

$$\Leftrightarrow \begin{cases} q = \frac{1}{3} \\ p = \frac{1}{3} \end{cases}$$

∴ The same as P_2

∴ the Nash equilibrium is (σ_1^*, σ_2^*) with $\sigma_1^* = \sigma_2^* = (\frac{1}{3}, \frac{1}{3})$