Homework Set 1

Hand write or type solutions for submission. Single-file pdf or word is preferred. Your work will be graded for correctness as well as completion. This means submitting work that is formatted clearly, and which includes sufficient work which both explains your thinkning and displays to the grader that the work is your own.

Question 1

(a) List two definitions of Nash equilibria, and discuss why the two definitions are equivalent.
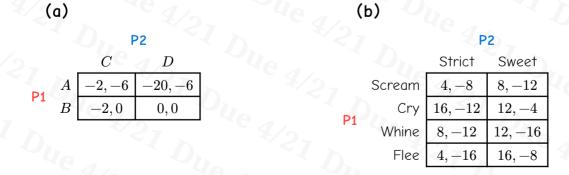
(b) Explain in your own words why we use NE.

Question 2

For each of the following games,
   (i) List the strategy space for each player,
   (ii) **Explicitly** write down the set of all strategy profiles

(a)

P2

		Dodge	Grab
	Hit	$2, 2$	$2, 0$
P1	Run	$2, 0$	$4, 4$

(b)

P2

		X	Y	Z
	A	$10, 6$	$6, 10$	$4, 12$
P1	B	$12, 4$	$8, 8$	$6, 10$
	C	$2, 14$	$12, 4$	$4, 12$

Question 3

For each of the following games, list the best response function for each player.

(a)

P2

		C	D
	A	$-2, -6$	$-20, -6$
P1	B	$-2, 0$	$0, 0$

(b)

P2

		Strict	Sweet
	Scream	$4, -8$	$8, -12$
	Cry	$16, -12$	$12, -4$
P1	Whine	$8, -12$	$12, -16$
	Flee	$4, -16$	$16, -8$

Question 4

Consider an arbitrary game G, consisting of two players: Tom and Fred. For some strategy X that Fred can play, You know that $\mathrm{BR}_T(X) = \{R, P, M\}$. Further, you know that $\pi_T(P, X) = 5$.

Can you determine $\pi_T(R, X)$? If so, what is it? Either way, **make sure to justify your response**.

Question 5

This problem aims at guiding you through the crucial difference between iterated deletion of strictly dominated strategies (IDSDS) and iterated deletion of textit{weakly} dominated strategies (IDWDS). When doing these methods, do not just cross out the results – list in order the explicit statement of what strategy weakly or strictly dominates another.

(a)

Start by recalling that iterated deletion of strictly dominated strategies produces a unique set of strategy profiles. Demonstrate this by performing IDSDS on the following game, using two different starting eliminations (that is, do it two separate ways).

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P2

		L	C	R
	T	$3,0$	$0,-5$	$0,-4$
P1	M	$1,-1$	$3,3$	$-2,4$
	D	$2,4$	$4,1$	$-1,8$

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(b)

Based on your answer to part (a), what is the (pure strategy) NE of this game? Is it possible that there is another one? How do you know?

(c)

Now consider the following game.

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P2

		L	C	R
	U	$2,2$	$2,0$	$6,0$
P1	M	$2,0$	$4,4$	$2,6$
	D	$2,6$	$6,2$	$4,5$

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(i)

Start by finding all (pure strategy) Nash Equilibria by underlining.

(ii)

Perform IDWDS starting by first eliminating M, then eliminating C, and then eliminating D. Justify these steps by stating explicitly what strategy dominates what, and then finish the IDWDS and report the result.

(iii)

Now perform IDWDS starting by first eliminating C, then eliminating M, and then eliminating R. Again, justify these steps explicitly, and then finish the IDWDS. If you get down to two options which weakly dominate each other, you are allowed to pick one to eliminate at random. What do you notice?

(d)

Summarize your results. That is, restate the theorem from class about IDSDS and compare it to the results from (c). List any shortcomings of IDWDS that you notice.

Question 6

Consider the following 5x5 two-player game.

P2

		R	Y	G	B	V
	A	$-1,-1$	$-6,8$	$11,-4$	$15,-9$	$18,-2$
	B	$6,-4$	$3,4$	$14,14$	$19,13$	$8,-9$
P1	C	$8,9$	$17,-8$	$20,2$	$20,0$	$-2,2$
	D	$8,16$	$19,-7$	$18,-2$	$15,11$	$11,10$
	E	$-6,2$	$-10,-4$	$-6,7$	$9,-2$	$-15,0$

Find all (pure strategy) Nash Equilibria using whatever method(s) you prefer.