

Homework Set 2

Due 5/12/24

Question 1

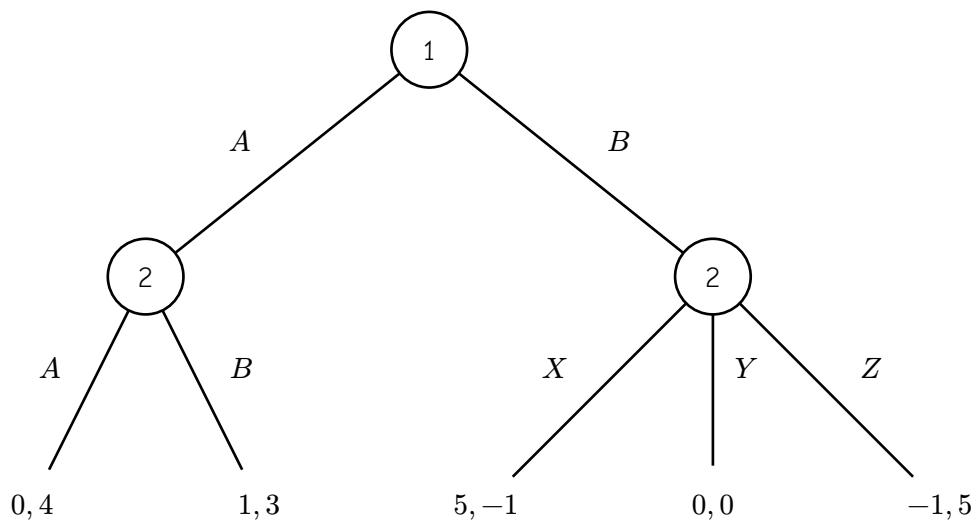
Adam and Emma are playing a game. Adam can either play “Saber” or “Force”, while Emma can pick either of “Levitate”, “Fire”.

Suppose Emma is going to play “Levitate”. What has to be true about Adam’s payoffs (from playing either one of his strategies, in response to “Levitate”) in order for him to rationally play a mixed strategy in response to “Levitate”?

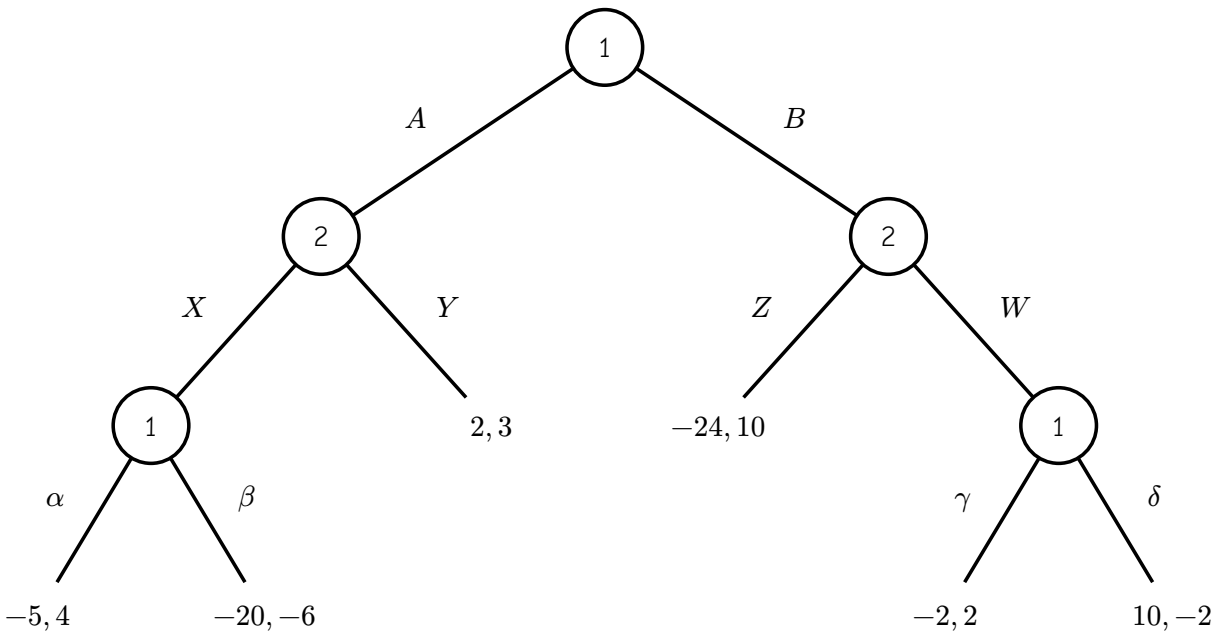
Question 2: SPNE

For each of the following games, use backward induction to find the SPNE. You don’t need to write down the full strategy profile, just mark up the game tree and circle/box the realized payoffs.

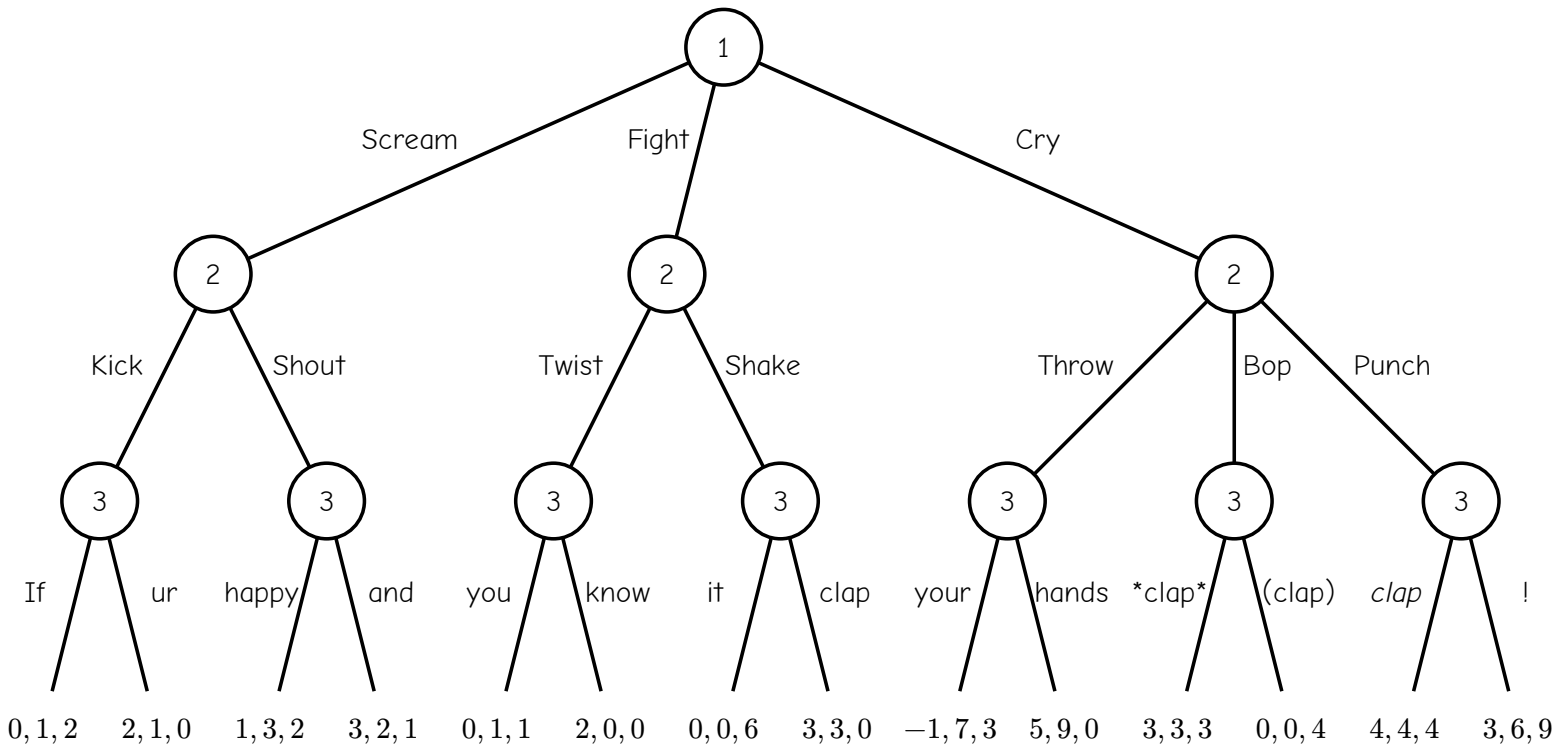
(a)



(b)



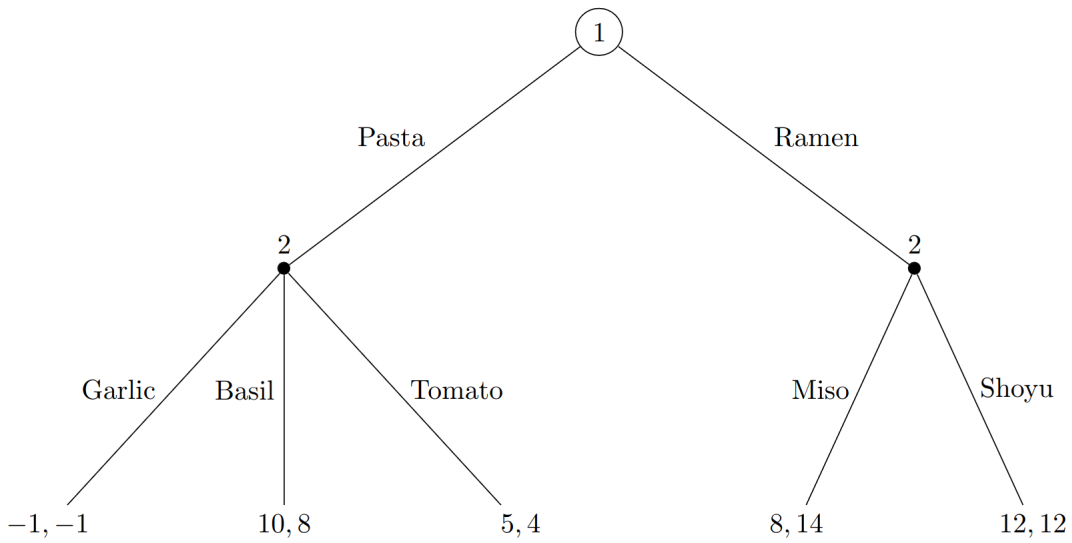
(c)



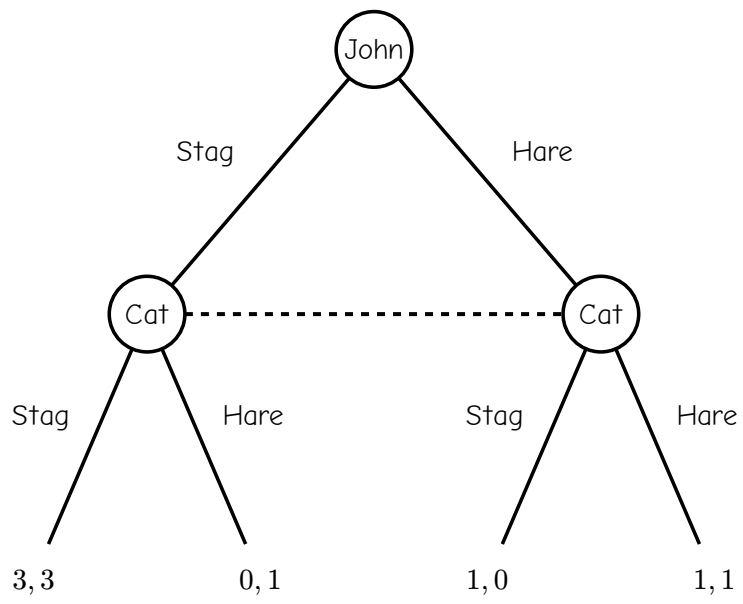
Question 3: Converting from EF to NF

For each of the following games, find all (pure strategy) Nash Equilibrium

(a)



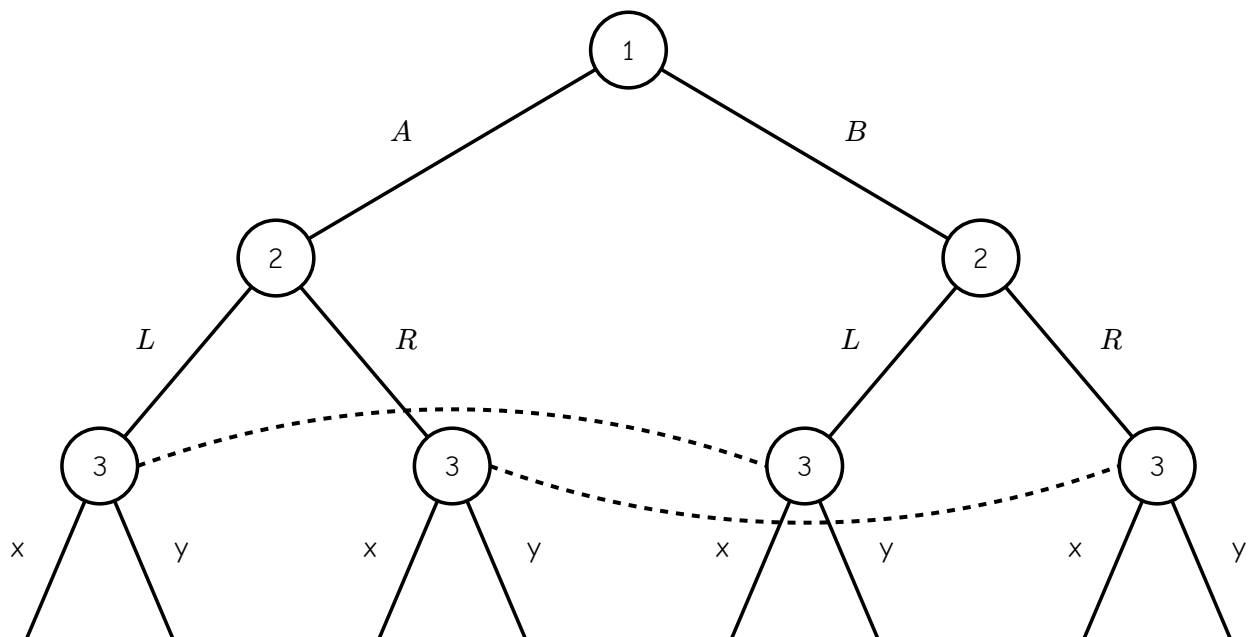
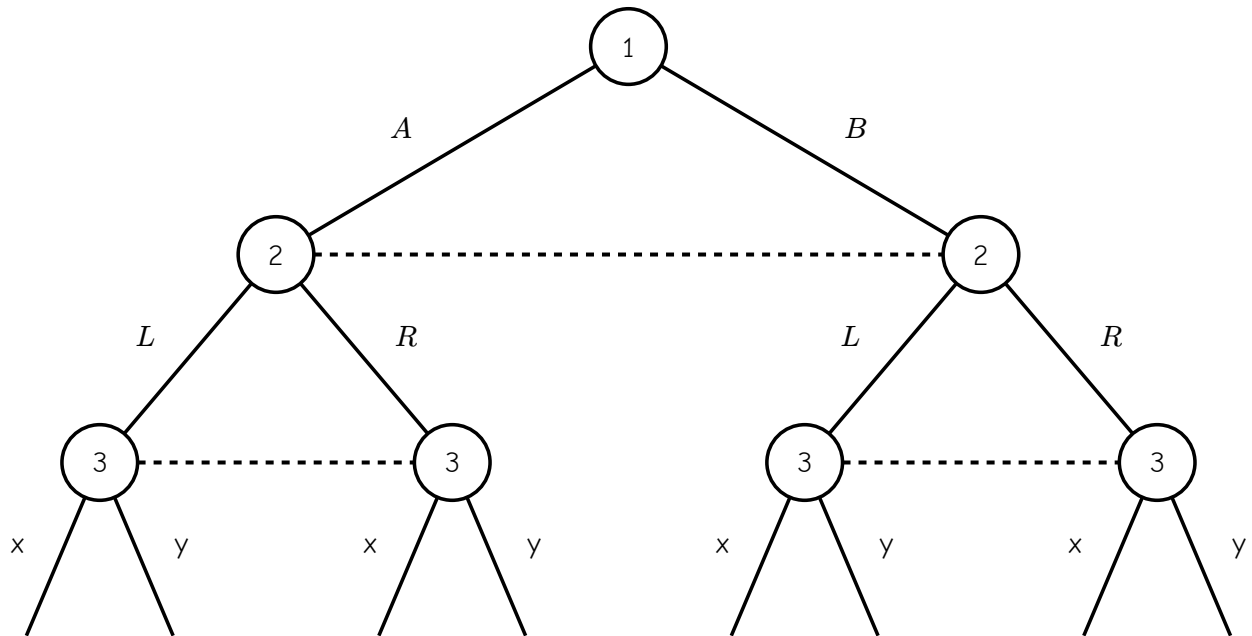
(b)



Question 4: Differences in Information

Across the following games, compare the differences in information for players 2 and 3. In particular, comment on the difference in player 3's knowledge of what players 1 & 2 did, and similarly player 2's knowledge of what player 1 did.

Additionally, write down two strategies for each player.



Blank space to respond to question 4:

Question 5: 3 Player Simultaneous-Move Games

As it turns out, we can use Normal Form games to model simultaneous interaction among 3 players. In the following game,

- ▶ Player 1 is the row player, and chooses up or down
- ▶ Player 2 is the column player, and chooses left or right
- ▶ Player 3 is the “game picker”, and chooses game A or game B

Player's payoffs are listed in order of player: (P1, P2, P3)

		P2			
		ℓ	r		
P1	u	2, 2, 2	9, 2, 9	P1	u
	d	1, 3, 3	6, 6, 0		d
		A			

		P2			
		ℓ	r		
P1	u	7, 7, 8	0, 1, 1	P1	u
	d	5, 5, 5	4, 4, 4		d
		B			

P3

A pure-strategy NE is found using similar methods to solving 2 player games:

- ▶ Start by underlining best responses as usual for players 1 and 2 in games A and B separately
- ▶ Looking at the same cell *across* games A and B , underline which payoff is better for player 3
 - For instance, looking at the (U, L) cell in each game, we see that P3's best response to (U, L) is B .
- ▶ After doing these steps, we are once again looking for the intersection of mutual best responses between **all** players simultaneously.

(a)

Underline all best responses for each player.

(b)

How many NE do you see? Pick any one of these NE and show/argue that no player will benefit from unilaterally deviating.

Additional Practice (ungraded)

Draw an extensive form game representing the normal form game depicted above

