Chapter 3.9 Review Questions: 2, 5, 6, 7, 9

Problem 2

Consider a static game + complete information.
Player 1 can play A,B,C,D
Player 2 can play E,F,G,H

Draw the payoff matrices.

Answer: Player 1 is on the left, and their payoff is shown first
Player 2 is on the top, their payoff is shown second

$$\begin{bmatrix} 3,1 & 2,0 & 3,1 & -2,0 \\ -2,0 & -1,5 & -2,0 & -1,5 \\ 5,1 & 5,1 & 0,0 & 0,0 \\ 0,0 & 0,0 & 1,5 & 1,5 \end{bmatrix}$$

Question: Identify the unique iterated dominant equilibrium.
Answer: (pg 67)
The iterated-dominant equilibrium is the strategy that remains after all of the dominated strategies have been eliminated.

Row 2 is dominated by row 4.

$$\begin{bmatrix} 3,1 & 2,0 & 3,1 & -2,0 \\ 5,1 & 5,1 & 0,0 & 0,0 \\ 0,0 & 0,0 & 1,5 & 1,5 \end{bmatrix}$$

Column 2 is dominated by column 1, column 4 is dominated by column 3

$$\begin{bmatrix} 3,1 & 3,1 \\ 5,1 & 0,0 \\ 0,0 & 1,5 \end{bmatrix}$$

Row 3 is dominated by row 1.

$$\begin{bmatrix} 3,1 & 3,1 \\ 5,1 & 0,0 \end{bmatrix}$$

Column 2 is dominated by column 1

$$\begin{bmatrix} 3,1 \\ 5,1 \end{bmatrix}$$

Row 1 is dominated by row 2
$$\begin{bmatrix} 5,1 \end{bmatrix}$$

Row 3, column 1 (C,E) is the iterated dominant equilibrium.

Problem 5

In prisoner's dilemna, behavior that is best for the group is not what is best for the indidual.

Question a) Provide an economic example of prisoner's dilemna:
Answer: An example of prisoner's dilemna is airline pricing. If their competitors set price below them, they will end up losing

consumers. Its better to cut prices than it is to lose customers altogether.

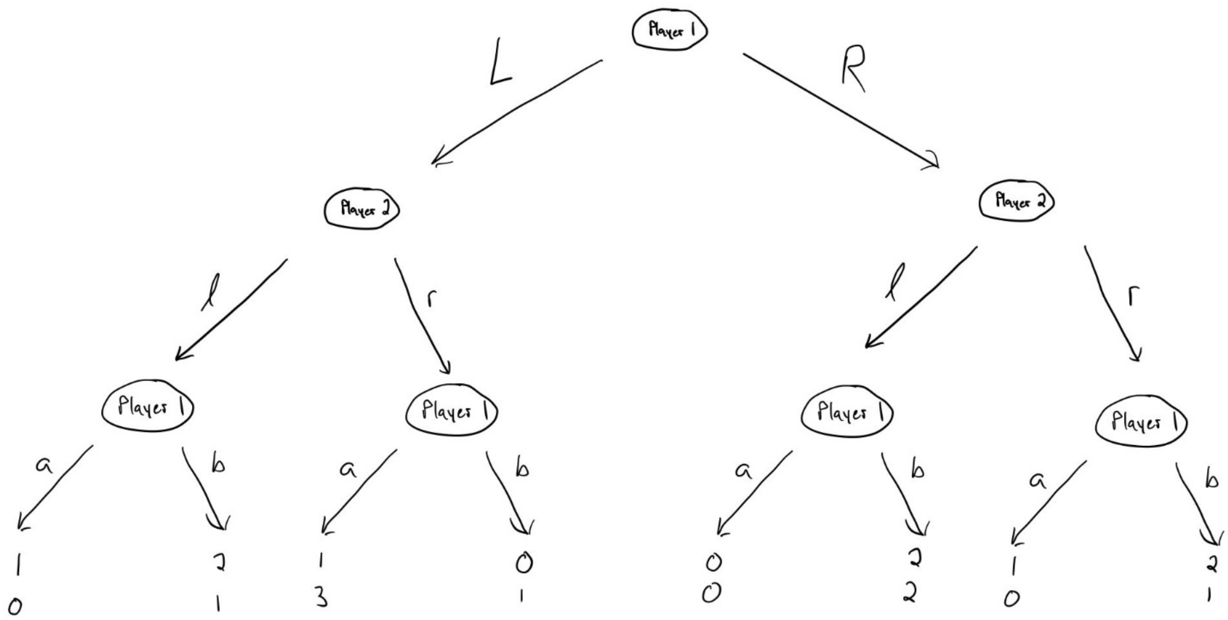
Question b) What is the pure strategy NE to this game?
Answer: The pure strategy is to always price as low as possible while still remaining profitable.

Question c) Why is this called a dilemna?
Answer: This is a dilemna because all of the airlines would be better off if they cooperated, but each individual airline will lose business if others set prices lower than them.

Problem 6

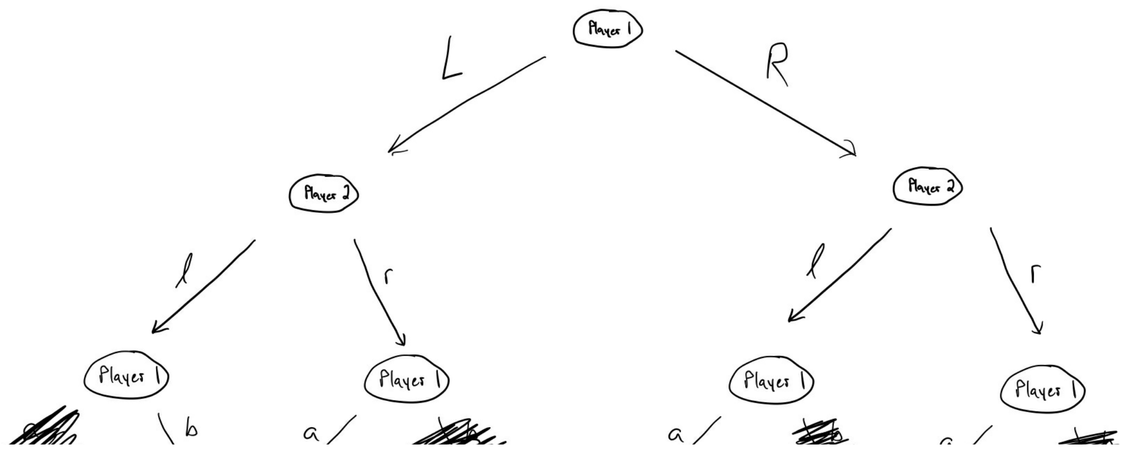
Assume this is a dynamic + perfect info + complete info + 3 stages.
Player 1 moves first, choose between L and R.
Player 2 moves second, choose between l and r.
Player 3 moves third, choose between A and B.

Question a) Game tree:

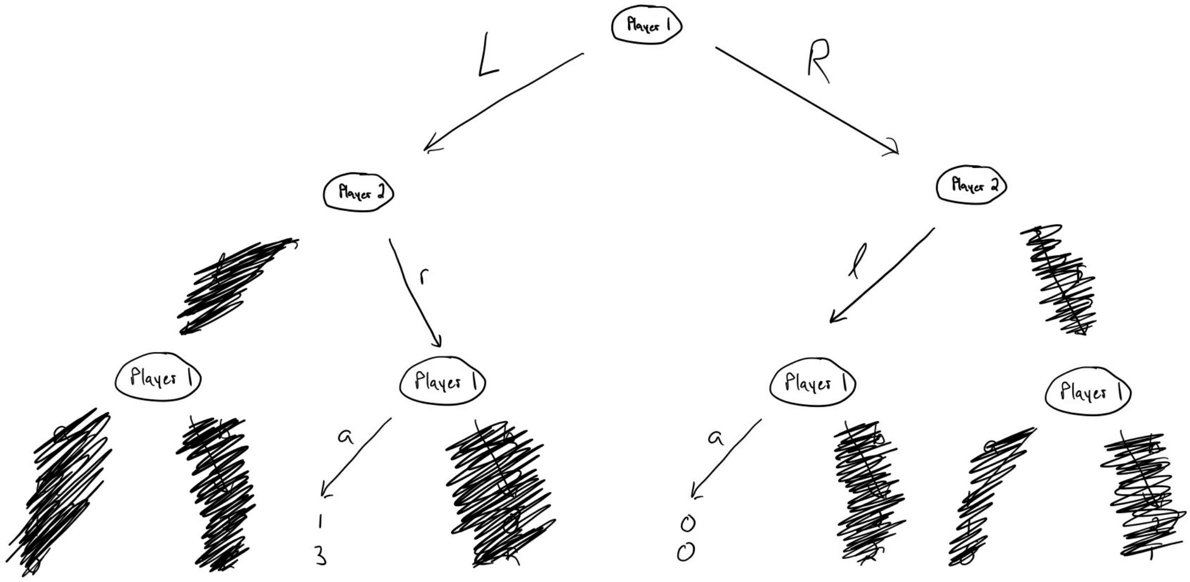


Question b) Use backwards induction to identify the unique SPNE to this game.
Answer:

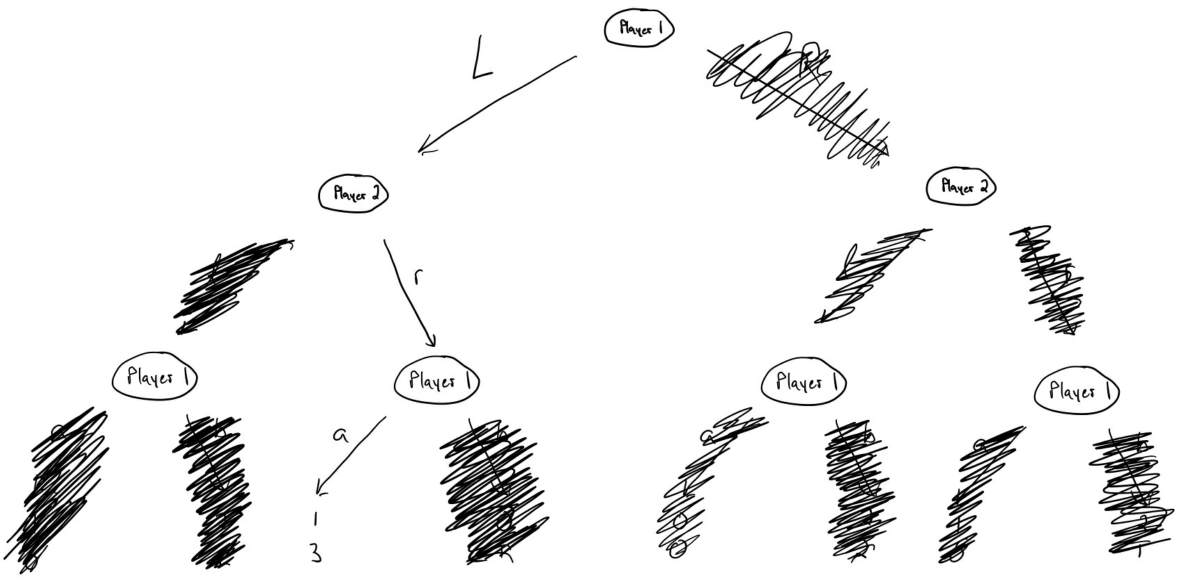
Going in order for player 1 (Choosing from the bottom 4):
b a b b



Going in order for player 2 (Choosing from the bottom 4):
For the left side: r
For the right side: ℓ



Initial node, player 1: L

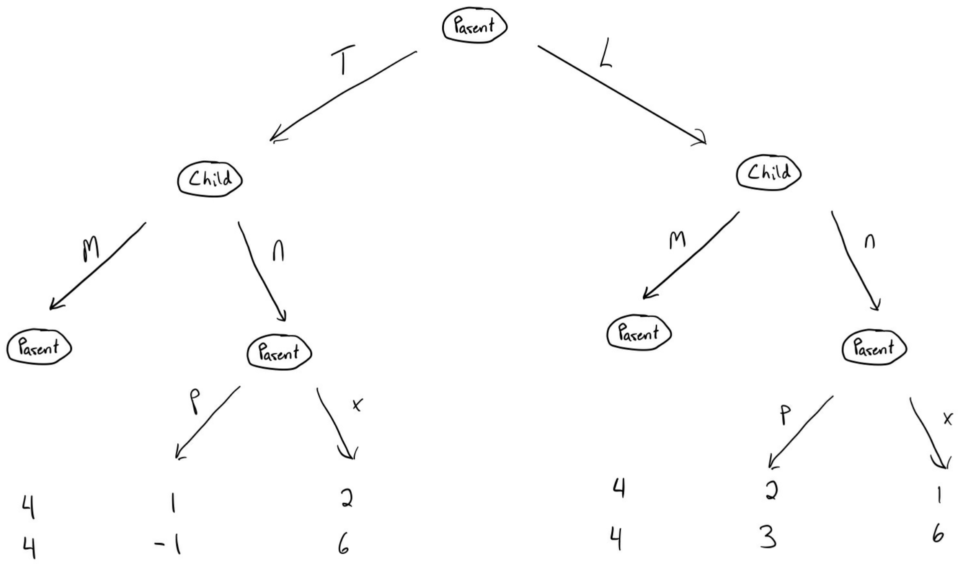


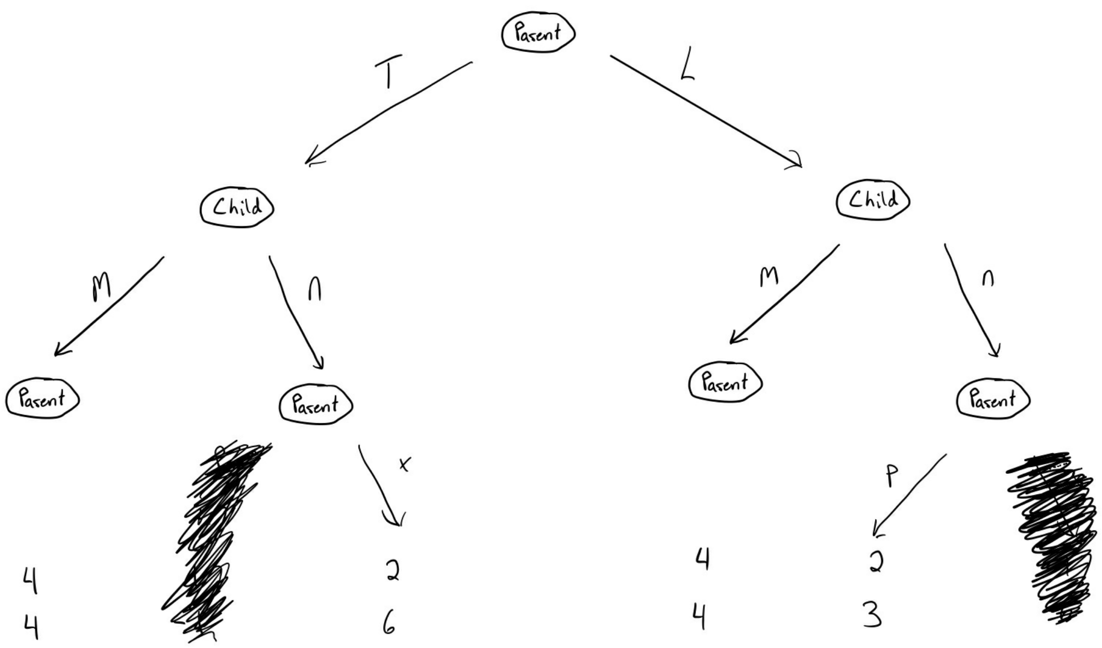
The SPNE is L - r - a
Payoff player 1: 1
Payoff player 2: 3

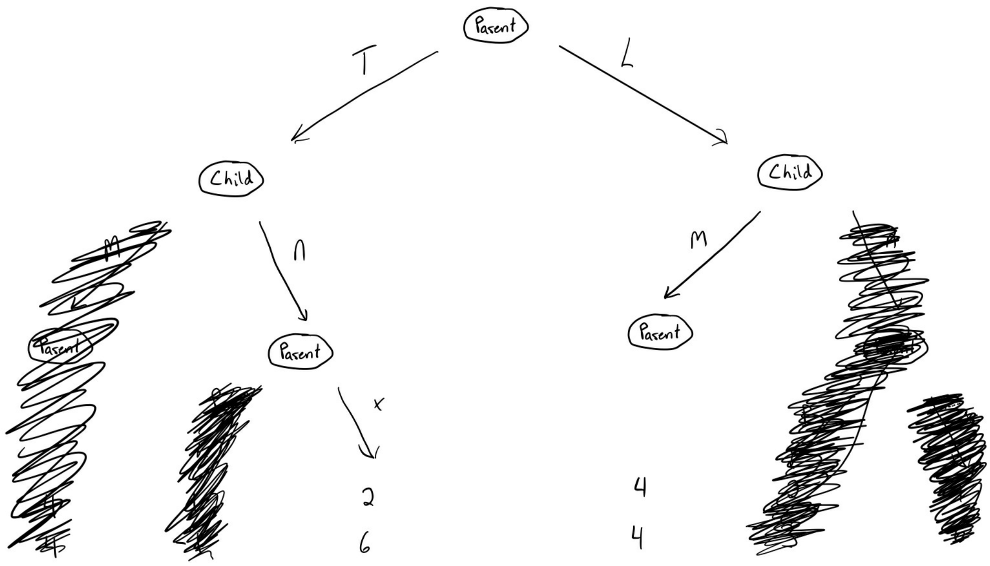
Problem 7

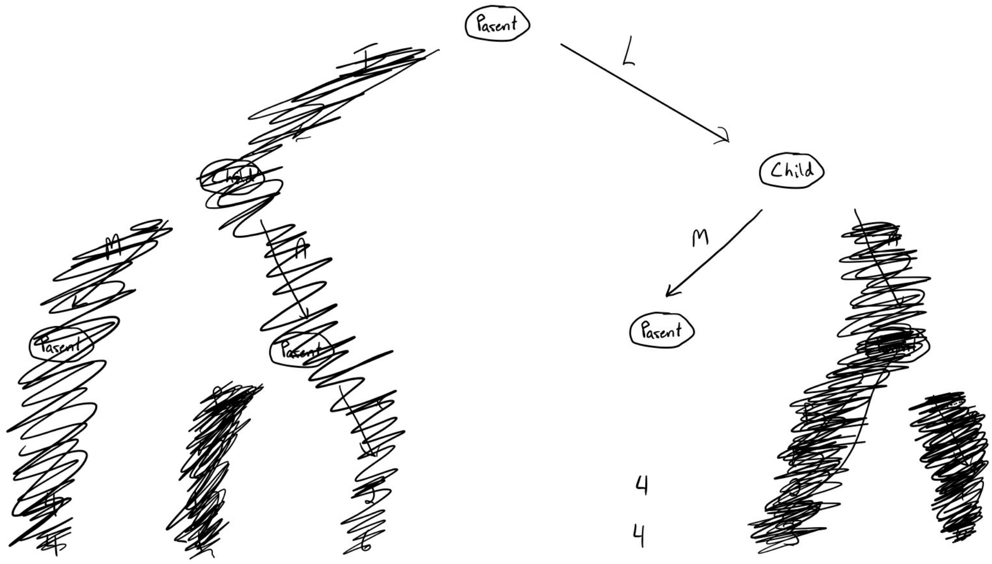
Assume this is a dynamic + perfect info + complete info + 3 stages.
Parent moves first, choose between "tough" and "lenient". **[T or L]**
Child moves second, choose between "mind rules" and "not mind rules". **[M or N]**
Parent moves third if child chooses N. Parent choose between "punish" and "not". **[P or X]**

Question a) Game tree









Question b) Backwards induction to identify SPNE
Answer: The SPNE is lenient (L) + mind the rules (M).
Payoff parent = 4
Payoff child = 4

Question c) How would you change the preferences of the parent so that "Tough + Mind the rules" is the SPNE? What kind of parent is this compared to the parent with the original payoffs?

Answer: You would change the preferences of the parent in the last step so that "not giving punishment" is provides less utility than punishment. Change T - n - x to 0. This is a parent who enjoys punishment more than they enjoy not going through with the punishment.

Problem 9

Merger game, Bazerman and Samuelson 1983
A big firm is considering buying a small firm. The small firm knows their own value. The big firm does not know the small firm's value.

From the perspective of the big firm, the small firm's value is uniformally distributed from 0 to 100 dollars.
If the small firm is bought, their value increases by 50% (eg small firm 80 dollar value becomes 120 dollar value).

$V_0 =$ Premerger value
$V_1 = V_0 * 1.5 =$ Postmerger value
P = Price paid to buy small firm

Big firm moves first, makes an offer for small firm.
Small firm moves second, accepts the offer if its greater than or equal to their true value.

Question: What offer maximizes the big firm's gain?
Answer:

The big firm wants: $P \leq V_0 * 1.5.$
The small firms wants: $P \geq V_0.$
To make both happy: $V \leq P \leq V_0 * 1.5.$

All firms valued from 0 $\leq$ p will accept

These firms ^ expected value = $\frac{p}{2}$
Remember we take half because the "true" value is uniformally distributed.

For the buyer, 1.5 $\frac{p}{2}$ = *.75p*
We used 1.5 because that is how much the smaller firm increases in value when they are bought.

We used $\frac{p}{2}$ *because that is the expected value of the firms that would accept an offer.*

1.5 $\frac{p}{2}$ = .75p

.75p = $V_0 * 1.5$ from the big firm's initial equation above
Good investment only if $P \leq .75P$, which is not the case here.

The buyer should not make the investment.