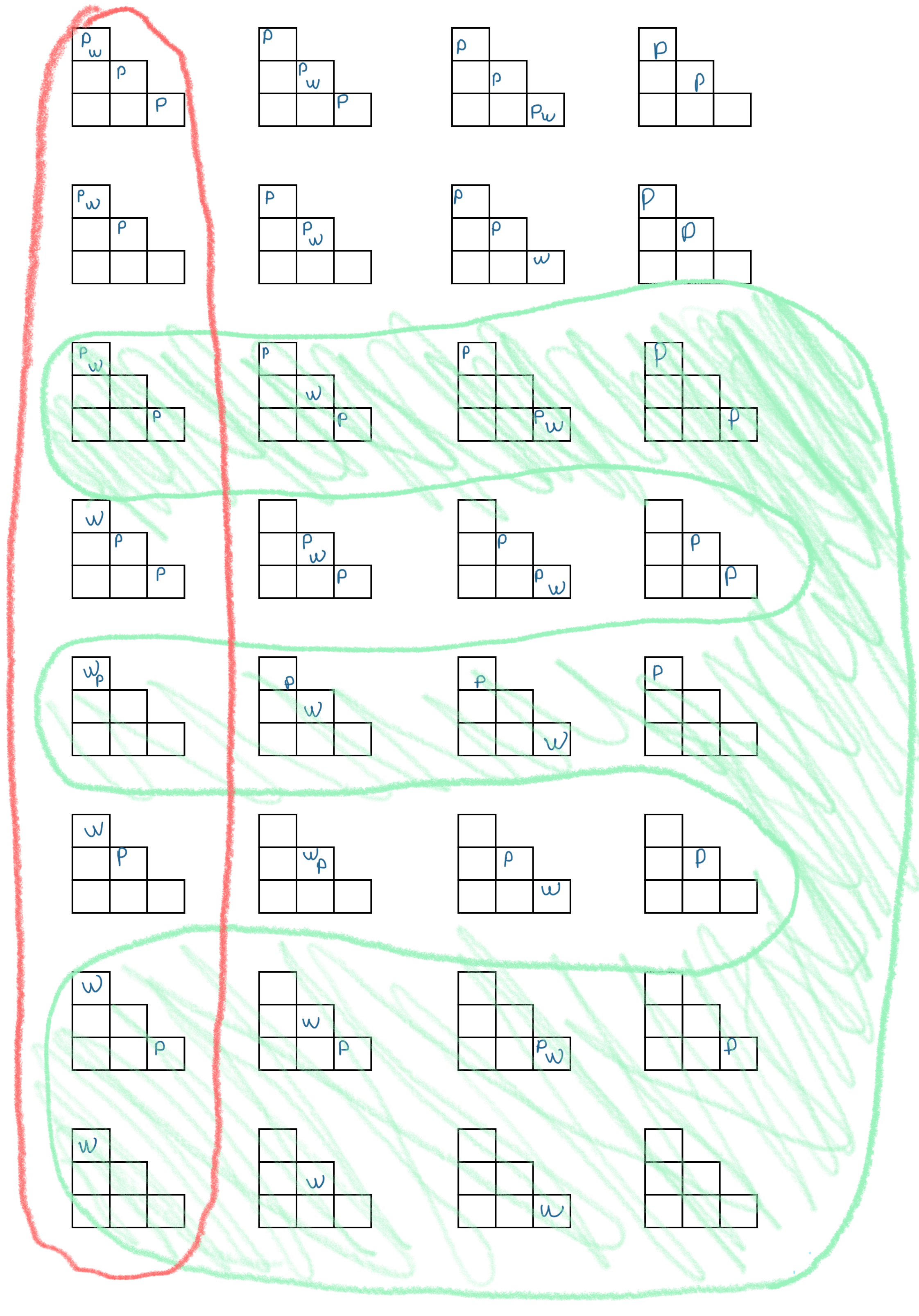
6.1



- a_3 : there is a wumpus in [1,3]
- a_2 : there is no pit in [2,2]

6.2

a. $B \vee C$

- There are 4 models
- Num of true models: 3

B	C	KB
T	F	T
T	T	T
F	F	F
F	T	T

b. $\neg A \vee \neg B \vee \neg C \vee \neg D$

- There are 16 models total
- Num of true models: 15

$\neg A$	$\neg B$	$\neg C$	$\neg D$	KB
F	F	F	F	F
F	F	F	T	T
F	F	T	F	T
F	F	T	T	T
F	T	F	F	T
F	T	F	T	T
F	T	T	F	T
F	T	T	T	T
T	F	F	F	T
T	F	F	T	T
T	F	T	F	T
T	F	T	T	T
T	T	F	F	T
T	T	F	T	T
T	T	T	F	T
T	T	T	T	T

15 trues

c. $(A \Rightarrow B) \wedge A \wedge \neg B \wedge C \wedge D$

- There are 16 models
- Num of true number: 0

Let $(A \Rightarrow B)$: J

A	B	C	D	J	$\neg B$	KB
F	F	F	F	T	T	F
F	F	F	T	T	T	F
F	F	T	F	T	T	F
F	F	T	T	T	T	F
F	T	F	F	T	F	F
F	T	F	T	T	F	F
F	T	T	F	T	F	F
F	T	T	T	T	F	F
T	F	F	F	F	T	F
T	F	F	T	F	T	F
T	F	T	F	F	T	F
T	F	T	T	F	T	F
T	T	F	F	T	F	F
T	T	F	T	T	F	F
T	T	T	F	T	F	F
T	T	T	T	T	F	F

6.3

a. $(\alpha \Rightarrow \beta) \equiv (\neg\beta \Rightarrow \neg\alpha)$

- Let $X = (\alpha \Rightarrow \beta)$

  Let $Y = (\neg\beta \Rightarrow \neg\alpha)$

α	β	X	$\neg\beta$	$\neg\alpha$	Y
T	F	F	T	F	T
T	T	T	F	F	T
F	F	T	T	T	T
F	T	T	F	T	T

- Because $X = Y \Rightarrow (\alpha \Rightarrow \beta) \equiv (\neg\beta \Rightarrow \neg\alpha)$

b. $\neg(\alpha \wedge \beta) \equiv (\neg\alpha \vee \neg\beta)$

Let $X = \neg(\alpha \wedge \beta)$

Let $Y = (\neg\alpha \vee \neg\beta)$

α	β	$\neg\alpha$	$\neg\beta$	X'	X	Y
T	T	F	F	T	F	F
T	F	F	T	F	T	T
F	T	T	F	F	T	T
F	F	T	T	F	T	T

- Because $X = Y \Rightarrow \neg(\alpha \wedge \beta) \equiv (\neg\alpha \vee \neg\beta)$

c. $\neg(\alpha \vee \beta) \equiv (\neg\alpha \wedge \neg\beta)$

- Let $X = \neg(\alpha \vee \beta)$
- Let $Y = (\neg\alpha \wedge \neg\beta)$

α	β	$\neg\alpha$	$\neg\beta$	X'	X	Y
T	T	F	F	T	F	F
T	F	F	T	T	F	F
F	T	T	F	T	F	F
F	F	T	T	F	T	T

- Because $X = Y \Rightarrow \neg(\alpha \vee \beta) \equiv (\neg\alpha \wedge \neg\beta)$

6.4 Base on Equivalence rules

a. $Smoke \Rightarrow Smoke$

- Unvalid

b. $Smoke \Rightarrow Fire$

- Valid

c. $(Smoke \Rightarrow Fire) \Rightarrow (\neg Smoke \Rightarrow \neg Fire)$

- Valid

d. $Smoke \vee Fire \vee \neg Fire$

- Unsatisfiable

e. $((Smoke \wedge Heat) \Rightarrow Fire) \Leftrightarrow ((Smoke \Rightarrow Fire) \vee (Heat \Rightarrow Fire))$

- Neither

f. $(Smoke \Rightarrow Fire) \Rightarrow ((Smoke \wedge Heat) \Rightarrow Fire)$

- Valid

Problem 6.6

b.

- I modified on the size of the board to 4x4
- Change the win length to 4
- Modify the `print_out` function to print a 4x4 board.
- Modify the `utility` function to check for 4 in a row.
- Modify the `is_terminal` function to check for a win on a 4x4 board.
  - Row win
  - Column win
  - Diagonal win
- I change the `move state` to fit with the 4X4 board.
- Modify `next_state` to fit with the 4X4 board.
- This took me about 2 hours to complete. c.