Task 1:

Max

A Tie

Task 2:

a.

b. if we knew that the maximum utility value is 10 then one the Left side of the tree returns 10 we no longer need to search more. Thus the entire right side is pruned. (along with what is pruned on the Left side).

Task 3:

did not do.

Task 4:

125

175   -50

0.5   0.5   0.75   0.25

200   150
                            -400   1000

200 · ½ = 100
150 · ½ = 75
—————
     175

150

0.25   0.25   0.5   400

-400   1000   0

-400 · ¼ = -100
1000 · ¼ = 250
0 · ½ = 0
—————
     150

-400 · ¾ = -300
1000 · ¼ = 250
—————
     -50

Decisions:
Start → 175 —50%→ 200
            ↓ 50%
          150 —→ 0
            50%
              —→ 1000
            25%
              —→ -400
            25%

The algorithm only chooses
the 175 chance which can
result in 200, 0, 1000, or -400.

Lowest possible outcome is:
    -400
Highest possible outcome is:
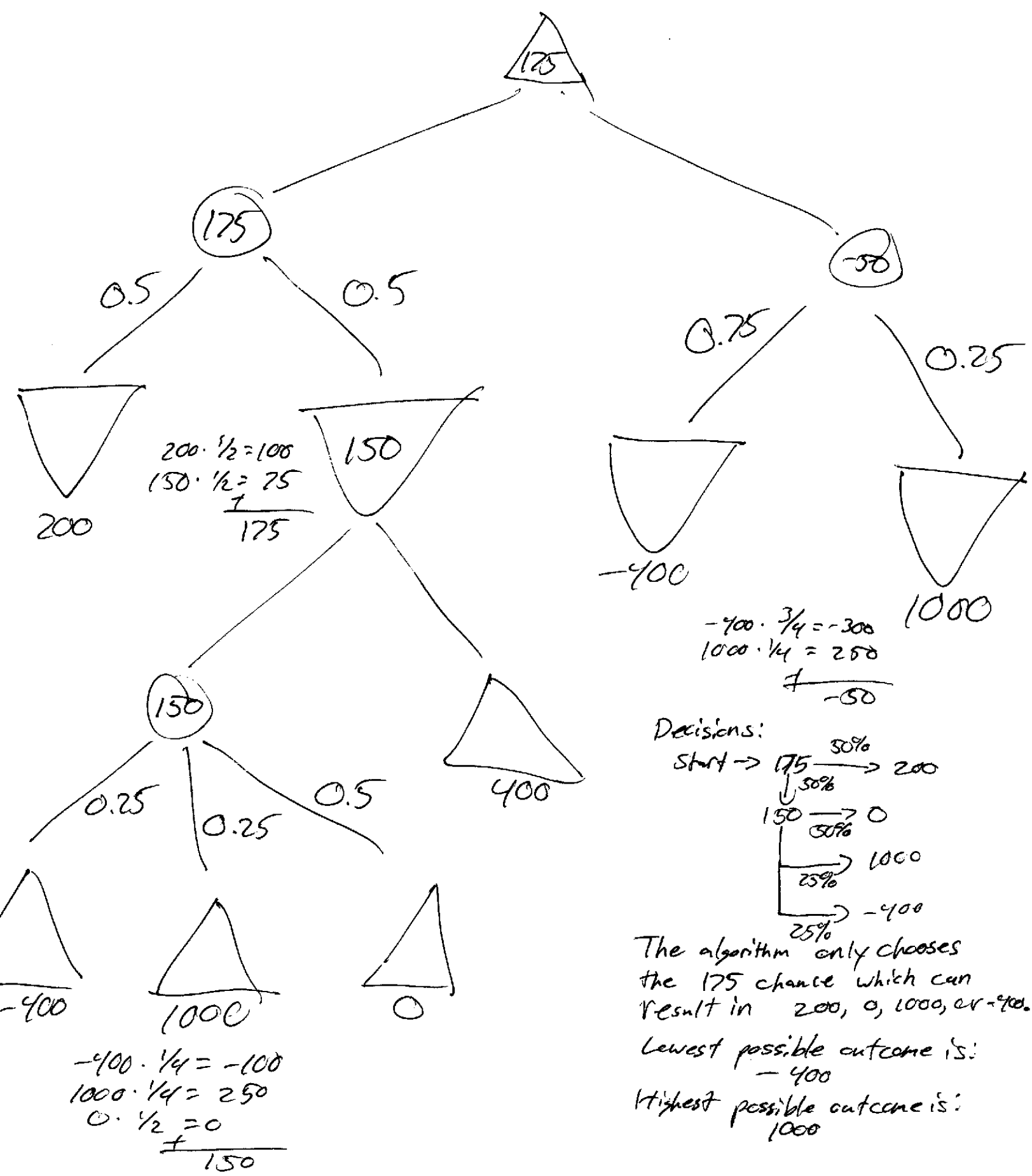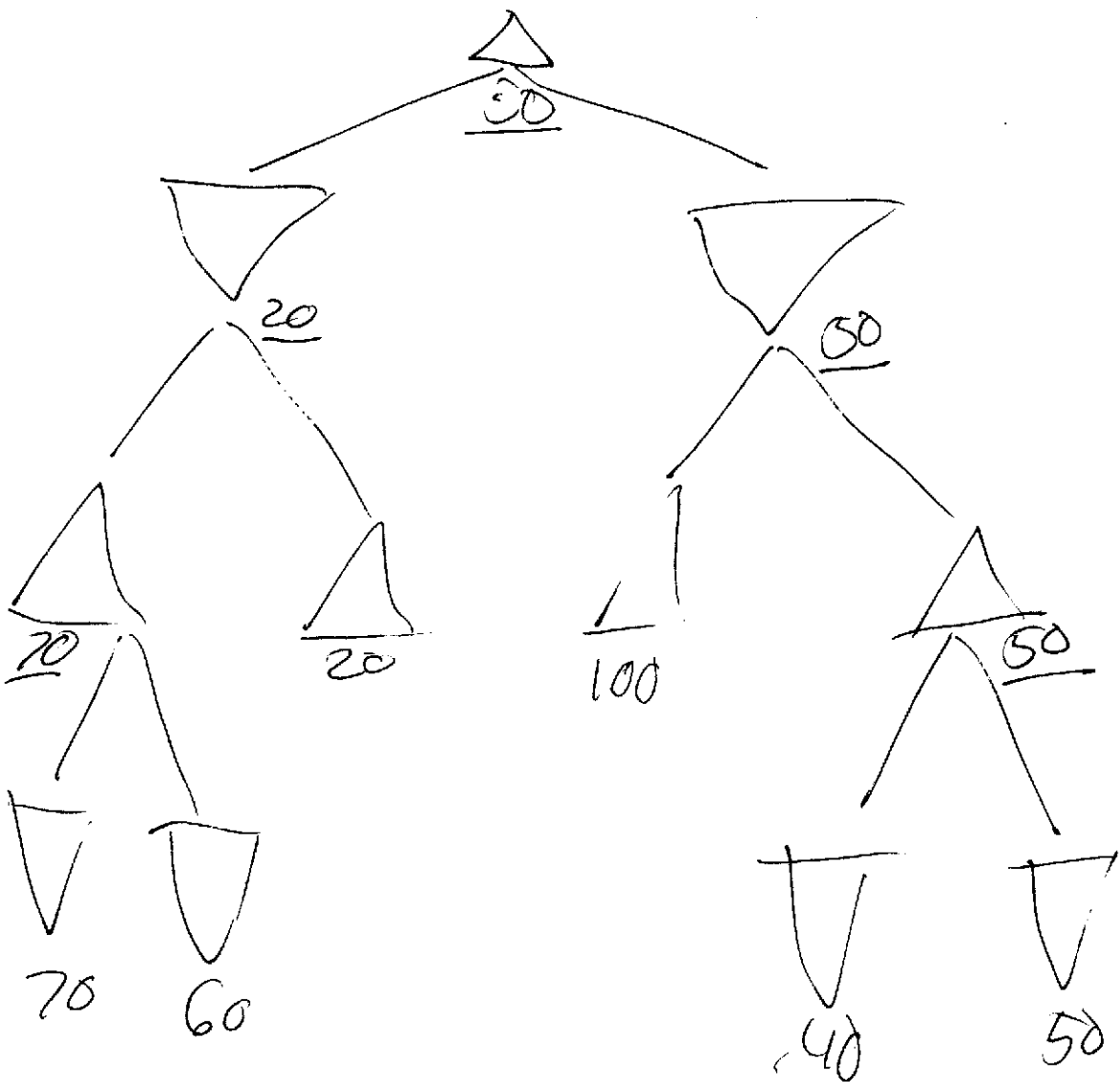   1000

Task 5

Minimax algorithm is only optimal if it is matched with an optimal opponent, thus if the opponent's algorithm is optimal then the result of the game is 50. However, if the opponent's algorithm is not optimal then it is possible for the game to result with 100.

Thus the worst outcome is 50 and the best is 100.

Task 6:

Did not do

Task 7:

a) Yes, because there is not a truth assignment where KB is true and S1 is false

b)

NOT(KB)	NOT(S1)
false	false
True	false
false	false

← Since NOT(KB) is true but NOT(S1) is false then NOT(KB) ⊭ NOT(S1)

Task 8:

A	B	C	D	KB
T	F	T	T	false
F	F	T	F	false
T	T	T	T	True
F	T	T	T	True
F	F	T	T	true
F	F	F	T	true
F	F	F	F	True
T	F	F	F	True
T	T	F	F	true
T	T	F	F	True
T	F	T	T	True
T	F	T	F	True

V - OR
∧ - AND
! - NOT

← (A∧!B∧C∧D)

← (!A∧!B∧C∧!D)

(A∧!B∧C∧D)∨(!A∧!B∧C∧!D)

(!A∨B∨!C∨!D)∧(A∨B∨!C∨D)
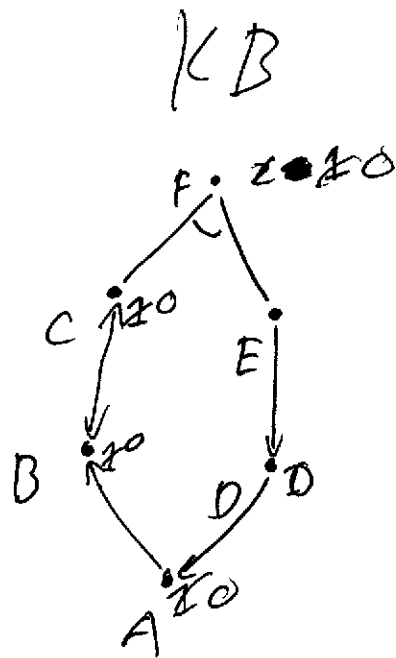
Task 9:

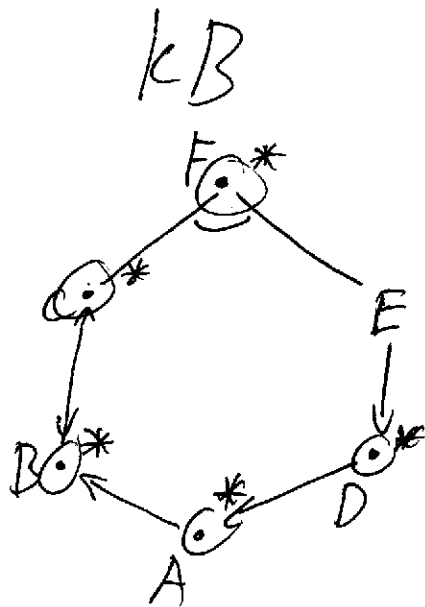i.

$A \Rightarrow B$

$B \Rightarrow C$

$E \Rightarrow D$

$D \Rightarrow A$

$C \text{ AND } E \Rightarrow F$

E

KB

explore D
explore A
explore B
explore C

All nodes are at zero thus
KB entails F.

ii.

KB

O - checking by BC

O^{*} - found to be true

O^{-} - found to be false

F with BC implies 7 need to
prove C and E by BC.

C with BC implies 7 need to prove
D by BC.

B with BC implies 7 need to prove
A by Bc.

A with BC implies 7 need to prove
D by Bc

D with BC implies 7 need to prove
E is true.

E is true, thus D is true.

D is true, thus A is true.

A is true, thus B is true.

B is true, thus C is true.

E and C are true, thus F is true.

Thus F is entailed by KB

$$A \Rightarrow B = \quad \neg A \lor B$$

$$B \Leftrightarrow C = \quad (B \Rightarrow C) \land (C \Rightarrow B) = (\neg B \lor C) \land (\neg C \lor B)$$

$$D \Rightarrow A = \quad \neg D \lor A$$

$$E \Rightarrow D = \quad \neg E \lor D$$

$$C \text{ AND } E \Rightarrow F = \quad (C \land E) \Rightarrow F = \neg(C \land E) \lor F$$

$$E \qquad = (\neg C \lor \neg E) \lor F$$
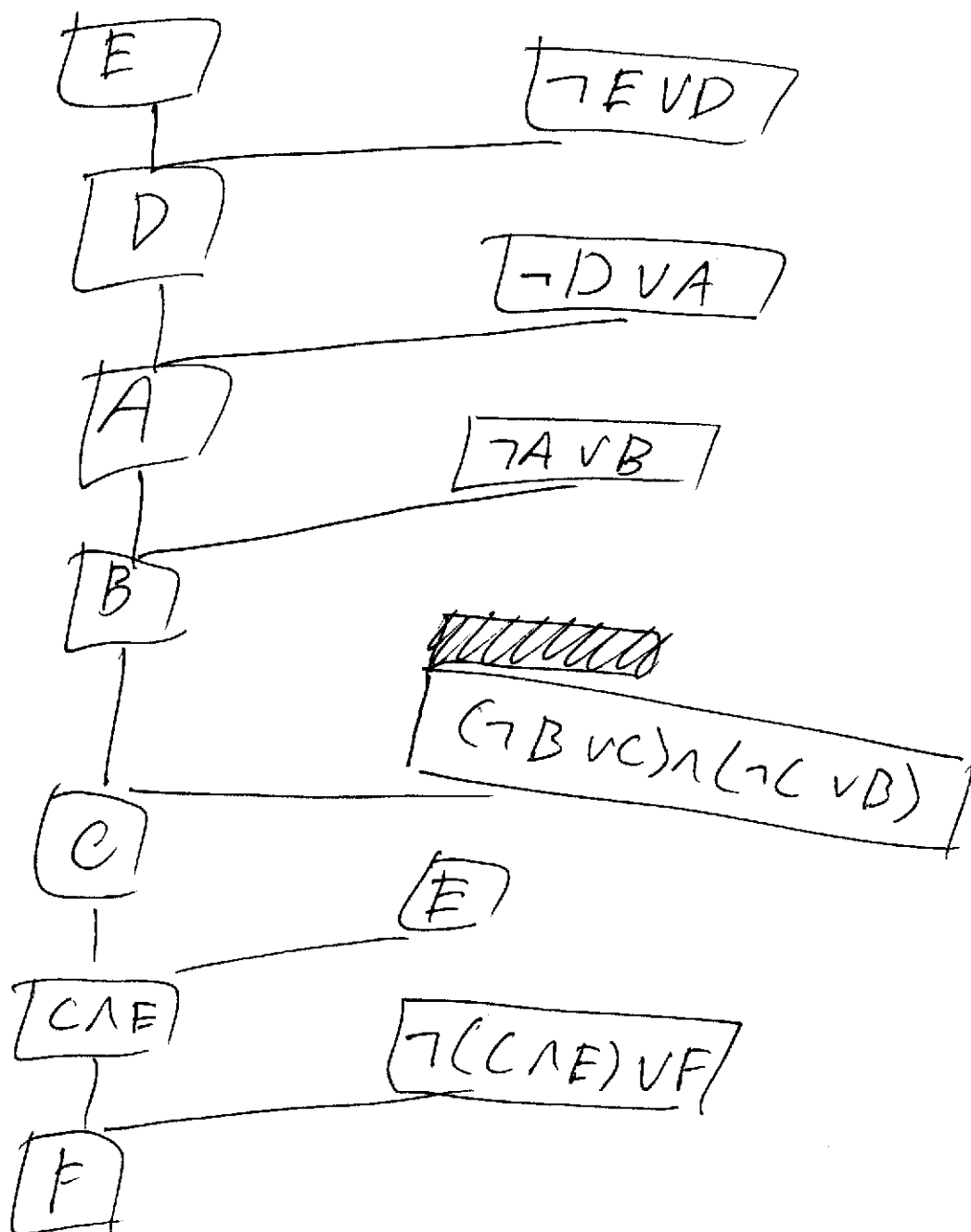
Task 10:

a). Constants: John, Mary, May

Predicate: Rains(x)   if it rains during x
            Gives(x, y) x gives y $10,000 check
            Mow(x)   x mows the lawn

$$\exists x\, Rains(x) \Rightarrow \exists w\, \exists y\, Gives(w, y)$$
$$\exists w\, \exists y\, Gives(w, y) \Rightarrow \exists y\, Mow(y)$$

b).
$$\exists x\, \neg Rains(x)$$
$$\exists w\, \exists y\, Gives(w, y) \longrightarrow$$
$$\exists y\, Mow(y) \longrightarrow$$

$$\longrightarrow \neg Rains(May)$$
$$Gives(John, Mary)$$
$$Mows(Mary)$$

c)
$$\exists x\, Rains(x) \Rightarrow \exists w\, \exists y\, Gives(w, y)$$
$$\neg \exists x \neg Rains(x) \lor \exists w\, \exists y\, Gives(u, y)$$
$$\exists x\, Rains(x) \lor \neg \exists w\, \exists y\, Gives(w, y)$$
$$Rains(x) \lor \neg \qquad \neg Gives(G(x), F(x))$$

$$Rain(x) \lor \neg Gives(G(x), F(x))$$

I couldn't tell if you wanted me to convert or not
the above is an example of converting.
I think my symbols are fine as they are (I think)

d) $\exists x \, Rain(x) \Rightarrow \exists w \exists y \, Gives(w,y)$

$\quad \hookrightarrow Rains(x) \lor \neg Gives(G(x), F(x))$

~~$\exists w (\Rightarrow \exists y \, Mow(y))$~~

$\exists w \exists y \, Gives(w,y) \Rightarrow \exists y \, Mow(y)$

$\quad \hookrightarrow$

$\qquad Gives(w, F(w)) \lor \neg \exists y \, Mow(F(w))$

$\exists x \, \neg Rains(x)$

$\quad \hookrightarrow \neg Rains(x)$

$\exists w \exists y \, Gives(w,y)$

$\quad \hookrightarrow Gives(u, F(w))$

$\exists y \, Mow(y)$

$\quad \hookrightarrow Mow(F(w))$

e) No because the contract doesn't state that it is illegal for John to give Mary $10,000 at random only that if it rains in Mary John must give Mary $10,000. Since Mary mowed the lawn after getting $10,000 she fulfilled her obligation.