

1. let x = 3 in let x = 7 in x * x

7 * 7
49

2. f ((\fn -> fn Paper) (\z -> whatItBeats z))

f((\z -> whatItBeats z) Paper)
f (whatItBeats Paper)
f Rock
1

3. case (Win (whatItBeats Rock)) of {Draw -> m; Win z -> (m + f z)}

case win scissors of {Draw -> m; Win z -> (m + f z)}
Win Scissors -> (m + f scissors)
4 + f scissors
4 + 100
104

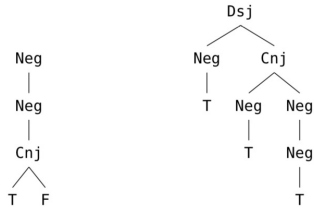
4. [optional] (\x -> x x) (\x -> x x)

(\x -> x x) (\x -> x x)
(\x -> x x) (\x -> x x)

We get an infinite loop.

2 Recursive functions on the **Form** type (6 points)

We can represent the structure of a **Form** with a tree, as illustrated by the following examples:



A. Write the expressions that these two trees represent.

1st Tree: $\text{Neg}(\text{Neg}(\text{Cnj } T \ F))$

2nd Tree: $\text{Dsj}(\text{Neg } T)(\text{Cnj}(\text{Neg } T)(\text{Neg}(\text{Neg } T)))$

5b.

B. In this problem, you'll try designing some FSAs of your own. Provide a graphical representation for an FSA that has $\{C, V\}$ as its alphabet and generates all and only those strings that contain at least two 'V's. Please submit a pdf for this. If you want to check whether your design is right, you can encode this FSA in Haskell as `fsa_twoVs :: Automaton SegmentCV`. It should behave like this:

```
*Assignment01> fsaSanityCheck fsa_twoVs
True
*Assignment01> generates fsa_twoVs [V,V,V,V]    two v's
True
*Assignment01> generates fsa_twoVs [V,C,V,C]    two v's
True
*Assignment01> generates fsa_twoVs [C,C,V,C]    one v
False
*Assignment01> generates fsa_twoVs []           empty
False
*Assignment01> generates fsa_twoVs [V]          one v
False
```

