Formal Model and Verification
Exercise 4: BNF, parsing trees, and derivation trees

1. We have the following grammar for English sentences.

   S ::= N A
   N ::= *John | Frank | Mary | Susan*
   A ::= V N | A *and* A
   V ::= *hates | loves | misses*

   Please draw the parsing tree of the following sentence.

   "*John hates Frank and loves Mary and misses Susan.*"

2. Please extend the BNF in problem 1 to include the following sentences.

"*John likes dogs that have a tail.*"

"A *cat that has green eyes hates dogs.*"

3. Please draw the derivation trees of the two sentences in your grammar for problem 2.

4. Please design a grammar in BNF for the following sentences.

Every husky is a dog.
Some dog is a husky.
Some dog that is a husky is a puppy.
Every husky is a dog that is a puppy.

5. Please draw the parsing trees for the sentences in your grammar proposed in problem 4.