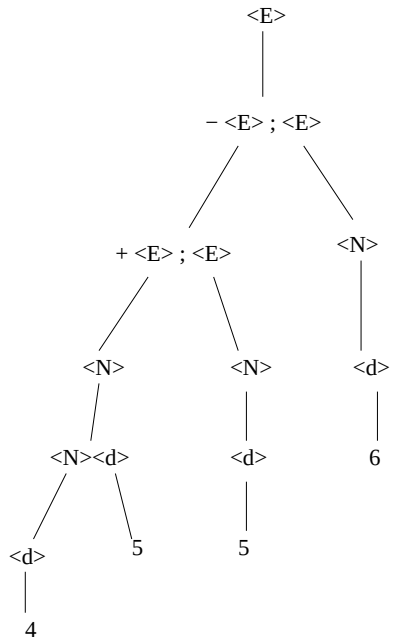
Homework 1 Solutions

1. Pretty much everyone got this one right. Note that there I prefer to have one line per rule use (many people drew a line to each non-terminal and terminal, but this is just a style issue.

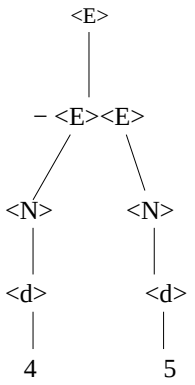


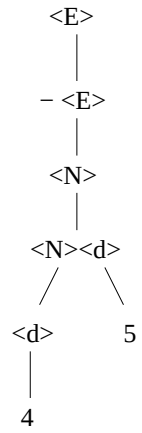
2. Note that in prefix the first operator given is the last one to be used, thus the unary minus gets used last – negating the entire expression.

(a) 3 4 + c d / +

(b) 007 Audrey 2 / + −

3. The grammar is ambiguous since it accepts the following two parse trees for the sentence "- 45"





4. Note that there is no way to get the correct meaning of EBNF braces without using recursion.

$\langle \underline{Guard} \rangle$ ::= $\langle Opnot \rangle \langle Pred \rangle$ | $\langle Guard \rangle \langle Logop \rangle \langle Pred \rangle$

$\langle Pred \rangle$ ::= $\langle Expr \rangle \langle Mop \rangle \langle Expr \rangle$

$\langle Expr \rangle$ ::= **Num** | **id**

$\langle Opnot \rangle$ ::= $\sim$ | ϵ

$\langle Logop \rangle$ ::= $\wedge$ | $\vee$

$\langle Mop \rangle$ ::= $<$ | $<=$ | $>$ | $>=$

5.

ifstmt ::= if *Guard* $\rightarrow$ *Slist* { [ ] *Guard* $\rightarrow$ *Slist* } fi

6. Make sure you understand why this grammar creates the proper precedence and associativity. How would I add another operator? How could I change the grammar to make subtraction right-associative?

$\langle \underline{Asgn} \rangle$ ::= $\langle lhs \rangle$:= $\langle Expr \rangle$ | $\langle lhs \rangle$, $\langle Asgn \rangle$, $\langle Expr \rangle$

$\langle Expr \rangle$ ::= $\langle Factor \rangle$ | $\langle Expr \rangle$ + $\langle Factor \rangle$ | $\langle Expr \rangle$ − $\langle Factor \rangle$

$\langle Factor \rangle$ ::= $\langle Term \rangle$ | $\langle Factor \rangle$ * $\langle Term \rangle$ | $\langle Factor \rangle$ / $\langle Term \rangle$

$\langle Term \rangle$ ::= ($\langle Expr \rangle$) | **Num** | **id**

$\langle lhs \rangle$ ::= **id**