Compilation A

(Excercises)

Keywords 1

Give short explanations of the following keywords:

Compiler, interpreter, scanner, parser, language, grammar.

What are the similarities and the differences between a compiler and an interpreter?

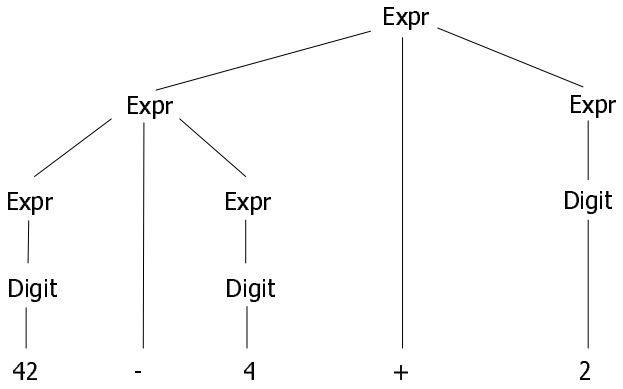
Excercise 1

The following *grammar* produces expressions consisting of digits 0,..., 9 separated by + and - signs.

```
Expr ::= Expr "+" Expr
       | Expr "-" Expr
       | Digit

Digit ::= "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"
```

As an example, consider the expression 42 – 4 + 2. It can be derived by the following *parse tree*:



(a) Give a parse tree deriving 5 + 9 – 7 - 3.

(b) Can you derive – 4 + 2 from the grammar? Justify your answer.

A grammar is *ambiguous* if it can derive a sentence with two different parse trees.

(c) Is the given grammar ambiguous? If this is so, try to find an unambiguous grammar producing the same language, that is, the same set of expressions.

Now lets add multiplication:

```
...
| Expr "*" Expr
...
```

(d) What are the possible parse trees for 42 – 4 * 2. Which one respects the higher precedence of the multiplication.

(e) How can you change the grammar to accommodate the higher precedence?