

# Homework # 2

## due Monday, February 9, 11:00 AM

### 1 Ambiguous Grammars

Some programming languages have “if” expressions:

```
<expr> ::= <expr> + <expr> | <expr> = <expr> | <expr> * <expr>
         | if <expr> then <expr> else <expr>
         | <INTEGER> | <ID> | ( <expr> )
```

Thus one can write:

```
(if x = 0 then 1 else 10 * x ) + y
```

However the grammar above is ambiguous.

- Show three parse trees for the string “if 1 = 2 then 3 else 4 \* 5 + 6”
- Rewrite the grammar to be unambiguous, where: if has lowest precedence, then =, then + and then \*, with highest precedence. Both + and \* should have left associativity, and = should be non-associative ( $x = y = z$  should be a syntax error).

### 2 Book Exercises

Please do exercises 4 and 5 (all four parts of each) in Chapter 4.

### 3 First Experience with ML

I assume you have a computer you can install software on. Install SML on your own computer. Start up a session and evaluate the following two expressions:

```
Time.now();
if 1 = 2 then 3 else 4 * 5 + 6;
```

Print out the window with the contents of this session. Indicate which of the three parse trees SML/NJ chose for the second expression.

### 4 Submitting Your Work

If you do not have your own computer, see me, and I will give you you an alternate assignment.

Turn in your answers on paper.