Homework II

1. [20 points]
Write ordinary BNF that is equivalent to the extended BNF below (omitting productions for <digit>); {...} denotes arbitrarily many, and [...] denotes optional. Justify your solution.
\[
<float> ::=
<digit>
{<digit>}
.
{<digit>}
[E [+|-] <digit> {<digit>}] 
\]

2. [45 points]
Using the BNF for Java (see Supplement 2), provide a derivation tree for each of the following, or identify the reason it is invalid. The derivation steps from <identifier> to a sequence of lower-case letters and digits that begins with a letter need not be shown.
(a) from <literal> derive: 54
(b) from <expression> derive: x!=54
(c) from <statement> derive: if (x!=54) if (x<54) break; else continue;

3. [30 points]
For each of the syntax diagrams below, provide a (extended) BNF definition that describes exactly the same language (C= \{0,1\}) and informally justify your answers.

(a) 
```
0
  \arrow{\downarrow} 1
  \arrow{\downarrow} 0
```

(b) 
```
0
  \arrow{\uparrow} 1
  \arrow{\downarrow} 0
```

(c) 
```
0
  \arrow{\uparrow} 1
  \arrow{\downarrow} 0
```