Com Sci 221 — Programming Languages
Assignment #5 — Winter 1994
Due Wednesday, February 9

1. Suppose that you are designing a language of boolean expressions using the binary infix operators & (*and*) and $\Rightarrow$ (*implies*). Notice that it is very common to express assertions of the form, "A and B and C and D imply E." Also notice that $(A\&B\&C\&D) \Rightarrow E$ is equivalent to $A \Rightarrow (B \Rightarrow (C \Rightarrow (D \Rightarrow E)))$.

   (a) In order to make *the particular form above* most convenient to express, while accommodating other forms reasonably as well, fill in the following rules about precedence and associativity:

      i. highest precedence should be assigned to (&, $\Rightarrow$, doesn't matter);
      ii. & should be (left-associative, right-associative, doesn't matter);
      iii. $\Rightarrow$ should be (left-associative, right-associative, doesn't matter).

      In each case, justify your choice in a couple of sentences.

   (b) Suppose now that you must eliminate the &, and use the equivalence mentioned above. Would you change the associativity of $\Rightarrow$? Very briefly, why or why not?

2. Briefly discuss the relations between the set-theoretic types

$$A + B + C + (A \times B \times C)$$

   and

$$(A + \{nil\}) \times (B + \{nil\}) \times (C + \{nil\})$$

   Are they equivalent? Nearly equivalent? Does one represent the other?