Section 1.1

We motivate the following discussion by noting that the syntax of a program in a language is usually a nested or tree like structure. Recursion is then an important technique in constructing and manipulating such structures.

Inductive specification is a method for specifying a set of values. For example, let's consider a set $S \subseteq \mathbb{N}$. We can define S as follows:

Definition 1. *A natural number $n \in S$ if and only if*

1. $n = 0$, *or*
2. $n - 3 \in S$.

We call this definition the ***top down definition*** *of S*

Definition 2. *Define the set S to be the smallest set contained in $\mathbb{N}$ and satisfying the following two properties:*

1. $0 \in S$, *and*
2. *if $n \in S$, then $(n + 3) \in S$.*

We call this definition the ***bottom up definition*** *of S*

Definition 3.

$$\frac{}{0 \in S}$$

$$\frac{n \in S}{(n+3) \in S}$$

We call this definition the ***rules of inference*** *of S*