CSci 550 : Program Semantics & Derivation
Spring Semester 2006, Assignment #3
Due Thursday, 23 February, 8:00 A.M.

1. Formalize the following sentences. Suppose an array $X[0..N)$ is given, where $N >= 1$.

   (a) Array X is increasing.

   (b) All values in X are distinct.

   (c) All values in X are equal.

   (d) X contains a 1, then X contains a 0 as well.

   (e) No two neighbors in X are equal.

   (f) The maximum of X occurs only once in X.

   (g) r is the length of a longest constant section of X.

   (h) All elements of X are prime numbers.

   (i) The number of odd-valued elements in X equals the number of even-valued elements.

   (j) r is the product of the positive elements of X.

   (k) r is the maximum of the sums of the sections of X.

   (l) X contains a square.

2. Specify a program that:

   (a) Determines the sum of the elements in a given integer array.

   (b) Given boolean array b contains a *true*, sets integer x to the smallest z such that $b.z$ holds.

   (c) Determines the number of distinct values in a given integer array.

   (d) Given that there is one, determines the second largest value in a given integer array.

3. Specify a program that:

   (a) Determines the length of the longest ascending section in a given integer array.

   (b) Determines the length of the longest section containing at most two distinct values in a given array.

   (c) Determines the length of the longest smooth section in a given integer array. A *smooth section* is a section in which no two elements differ in value by more than 1.