Proving the Partial Correctness of a Simple Algorithm with a While Loop

A Sample Assignment

Consider the following computation problem.

Is Array Increasing?

Precondition: An integer array A with some positive length n is given as input.

Postcondition: The Boolean value `true` is returned if $A][i] < A[i + 1]$ for every integer i such that $0 \leq i \leq n-2$. The Boolean value `false` is returned, otherwise.

Consider, as well, the following algorithm.

```
boolean arrayIncreasing ( integer[] A ) {
1. integer i := 0
2. while (i ≤ A.length − 2) {
3.   if (A[i] ≥ A[i + 1]) {
4.     return false
     } else {
5.     i := i + 1
     }
   }
6. return true
}
```

1. State a ***loop invariant*** for the above algorithm, when considering it as an algorithm for the "Is Array Increasing?" problem.

2. Use this loop invariant to prove that this algorithm is partially correct.