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CS 858

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Assignment 1

**Exercise 2.1-3**

**for** *i* = 1 **to** n

**if** A[*i*] == *v*

**return** i

**return** *NIL*

**Invariant**: Each element is accessed only once.

**Proof:** The variable *i* starts at 1. After the body of the for loop, *i* is incremented by 1. *i* is never incremented by more than one, and is never decremented.

**Invariant:** When *v* is found, *i* is at the correct index.

**Proof:** We proved that each element is accessed only once. This means that *i* must start at the beginning of the array and solely increment by 1 until it reaches the end of the array. Therefore, if A[*i*] has the value *v*, *i* is the correct index.

**Invariant:** If *v* is not in A, *NIL* is returned.

**Proof:** We proved that each element is accessed only once. We also proved that when *v* is found, *i* is at the correct index. Therefore, if *v* is not found, the for loop will terminate, and *NIL* will be returned.

**Exercise 3.1-1**

We are trying to prove the following:

First, prove that :

Next, prove that :

Therefore, .