

Worth: 2%

Due: By 6pm on Wednesday 25 March

1. Consider the Linear Search algorithm from class, with additional comments.

```
def LS(A,x):
    """ Returns an index i such that A[i] == x;
        returns -1 if there is no such index. """
    # Precondition: A is a list and x is a value (that may or may not
    #   belong to A).
    # Postcondition: If x does not belong to A, returns -1; otherwise,
    #   returns the smallest index i such that A[i] == x.

    i = 0
    # Loop invariant: 0 <= i <= len(A) and x does not belong to A[0..(i-1)]
    #   (with the convention that A[0..-1] denotes the empty list).
    while i < len(A):
        if A[i] == x: return i
        i = i + 1

    return -1
```

Write a detailed proof of the loop invariant, assuming that the precondition is true. (In particular, start with precise statements of the claims you are proving.)