CSC236 Tutorial Exercises, July 5

These exercises are to give you practice with loop invariants and iterative algorithms.

1. Consider the following algorithm:

```
func(n):
    # Pre: n is a natural number
    x = 0
    i = 0
    while i < n:
        i = i + 1
        x = x + i
    return x
```

   (a) State postconditions for this algorithm.

   (b) Use induction to prove the loop invariants $i \leq n$ and $x = \sum_{j=0}^{i} j$ for the while loop.

   (c) Prove that the loop terminates.

2. Prove that the following function is correct (by showing partial correctness and termination), according to its pre- and postconditions.

```
def f(A):
    # Pre: A is a list of integers
    # Post: Returns true if and only if there is an even number of positive
    # numbers in A
    even = True
    i = 0
    while i < A.length:
        if A[i] > 0:
            even = not even
        i = i + 1
    return even
```