Loop Invariants

4. Give a useful loop invariant of each loop. Indicate the places in the code where the invariant holds.

(a) For this problem, assume that \(A[0] \ldots A[n-1]\) is an array of integers, where \(n\) is a positive integer.

```c
int i = 0;
int j = 0;

while(j < n-1){
    if(A[j] < A[i]) i = j;
    j++;
}
```

(b) For this problem, assume that \(A[0] \ldots A[n-1]\) is a sorted array of integers, where \(n\) is a positive integer, and that \(B\) is an integer.

```c
int lo = 0;
int hi = n;

while(lo < hi){
    int mid = (lo+hi)/2; // truncated division, as in C++
    if(A[mid] < B) lo = mid+1;
    else hi = mid;
}
```

if ( ) cout << "Yes" << endl; // I need to insert a condition here!
else cout << "No" << endl;

It should be clear to you what the purpose of this code is. What do you think the condition of the if statement should be?
(c) For this problem, assume that $X[0] \ldots X[n-1]$ is an array of real numbers, where $n$ is a positive integer.

```c
real sumPositive = 0;
int i = 0;

while (i < n){
    if (X[i] > 0)
        sumPositive += X[i];
    i++;
}

cout << sumPositive << endl;
```