CSE 101: Homework 3

Due: Day 16

Exercises

1. *25 pts.* Following is an algorithm that correctly calculates the remainder division of two positive integers n and k (in C, it would be written as n % k).

```
Function mod(n, k)
Precondition: ____________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
Begin
result = n
Loop
    Loop Invariant: ____________________________________________
    _____________________________________________________________
    _____________________________________________________________
    _____________________________________________________________
    _____________________________________________________________
    Exit when result < k
    result = result - k;
Endloop
End
Postcondition: result is the remainder of dividing n by k
```

(Hint: It may be helpful to recall that n % k = (n - k) % k for n $>$ k, and that the ultimate value of n % k must be between 0 and k-1 inclusive.)

   (a) *10 pts.* Fill in the Precondition and Loop Invariant necessary to prove the Postcondition.

(b) *10 pts.* Prove the algorithm is true by proving the Loop Invariant and Postcondition. When you prove the Postcondition, the only information you may use from the loop is the Loop Invariant and Exit Condition.

2. *Kleinberg* Chapter 6, Exercise 2. *25 pts.*

3. *Kleinberg* Chapter 6, Exercise 4. *25 pts.*

4. *Kleinberg* Chapter 6, Exercise 5. *25 pts.*

5. *Kleinberg* Chapter 6, Exercise 17. *Extra credit, 20 pts.*