

**CSCI 531 Spring 2010**  
**QUIZ 2**  
Assigned Thursday, 10-01-14

1. Show that the following program fragment, with precondition  $i = 1 \wedge sum = 0 \wedge n \geq 1$ , terminates:

```
while (i <> n) do
  begin
    sum := sum+i;
    i := i+1
  end
```

**Answer:** Consider the quantity  $n - i$ , where we identify the names of variables with their values. This quantity starts nonnegative, because the precondition  $i = 1 \wedge sum = 0 \wedge n \geq 1$  entails  $n - 1 \geq 0$  at the beginning of the loop. This quantity always decreases as the body of the loop is executed, because  $i$  increases by one, while  $n$  remains the same. This quantity never becomes negative, because the loop body is executed only if  $n \neq i$ . So, as the program executes,  $n - i$  decreases monotonically, and  $n - i$  cannot become negative. Therefore, the program stops.

2. Do you know what a loop invariant is? (Please answer yes or no.)

**Answer:** There is no correct answer. 19 of 32 students answered no.