

**Scientific Computing**  
**Homework 1**  
**Assigned: Sept. 6; Due: Sept. 13**

1. **Written Homework:** Problems 1, 2, 7 at the end of the first chapter in the lecture notes on “Sources of Error”.
2. **Programming Assignment:** Consider the infinite series

$$\sum_{N=1}^{\infty} \frac{1}{N(N+1)},$$

which converges mathematically. (Note however that in floating point arithmetic it is no longer an infinite series.)

This assignment is to compute the above sum going forwards starting at  $N = 1$ , and going backwards, ending at  $N = 1$ . When you go forwards, stop summing when the next term doesn't change the answer, or when you hit the largest integer. When you go backwards, start from that ending value and sum down to  $N = 1$ . Comment on the difference in the two sums. Your program should print that number, along with the answer.

To more clearly figure out which is more accurate, repeat the experiment above summing forward and backwards, but only sum to  $N = 10^4$  using single precision arithmetic. Comment on the magnitude of the difference between the two sums. Which do you think is more accurate?

Hand in your program and its output. Most important is your analysis of your answers. Pay attention to the type of your variables, and make explicit casts if necessary. Note that even though this program is very short, it may take a while to run. Try using the *optimize* flag on your compiler, and report on the difference in execution time when using it.