HW8: Released Monday, week 9 and due Thursday, week 9

1. List any students you discussed with on this homework assignment: _____

These should still be your own answers, but it is ok to check answers and discuss your reasoning with your classmates.

Running code snippets from the homework is ok, but please take a moment to read through the code yourself first and figure out what you think it will do—you will learn how the code works much better if you think through it first before checking, *especially* if your initial assessment was wrong.

2. (2 points) How does a recursive function know when to stop recursing?

3. (3 points) What is a stack overflow (and how does it relate to recursion)?

4. (6 points) Given the mathematical series defined as follows, which can be used to calculate the natural log of 2:

$$\sum_{k=1}^{\infty} \frac{1}{2^k k} = \frac{1}{2} + \frac{1}{8} + \frac{1}{24} + \frac{1}{64} + \frac{1}{160} + \ldots = ln(2)$$

The following function computes this sum up to the nth element (starting at 1). If n is less than 1, the function will just return 0.

```
double series(double n){
	double sum = 0;
	for(int i = 1; i <= n; ++i){
		sum += 1/(pow(2, i) * i);
	}
	return sum;
}
```

a. Write a base case for the recursive version of this function

b. Write a recursive call for the recursive version of this function.

5. (9 points–4 for part a, 5 for part b) Given a positive integer (could be 0), write a recursive function that adds up all of the digits in the integer repeatedly, until there is only a single digit:
   addUp(302) = 5 (3 + 0 + 2 = 5)
   addUp(10294) = 7 (1 + 0 + 2 + 9 + 4 = 16, 1 + 6 = 7)
   addUp(8) = 8

   This should be accomplished in two parts:

   a. Write a helper function addOnce() that takes in an integer and returns an integer. Its job is to add up all of the digits in a single number, and can be done either with recursion or loops depending on your preference.

   b. Write the function addUp that takes in an integer and returns an integer, to be used as described above. This function should use the addOnce function to simplify the computation, and must be recursive.