**CSL 333: Operating Systems**

**Take home Lab # 2**

**11.09.2017**

**Maximum Points: 20**

**The submission deadline for the lab is: 11 PM, Monday, September 18, 2017.**

1. **(10 points)** The Collatz conjecture concerns what happens when we take any positive integer n and apply the following algorithm:

n = n/2, if n is even

n = 3 x n + 1, if n is odd

The conjecture states that when this algorithm is continually applied, all positive integers will eventually reach 1. For example, if n = 35, the sequence is

35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1

Write a C program using the fork() system call that generates this sequence in the child process. The starting number will be provided from the command line. For example, if 8 is passed as a parameter on the command line, the child process will output 8, 4, 2, 1. Because the parent and child processes have their own copies of the data, it will be necessary for the child to output the sequence. Have the parent invoke the wait() call to wait for the child process to complete before exiting the program. Perform necessary error checking to ensure that a positive integer is passed on the command line.

2. **(10 points)** Design a program using pipes in which one process sends a string message to a second process, and the second process reverses the case of each character in the message and sends it back to the first process. For example, if the first process sends the message “Hi There”, the second process will return “hI tHERE”. This will require using two pipes, one for sending the original message from the first to the second process and the other for sending the modified message from the second to the first process. Write this program using UNIX pipes.