New York University
Tandon School of Engineering
Department of Electrical & Computer Engineering

Introduction to Operating Systems (CS-GY6233)
Fall 2020

Assignment 4
(15 points)

1. (5 points) If you create a main() routine that calls fork() three times, i.e. if it includes the following code:
   pid_t pid1, pid2=55, pid3;
   pid1 = fork();
   if(pid1==0) pid2 = fork();
   pid3 = fork();
   Draw a process tree similar to that on slide 13, clearly indicating the values of pid1,pid2 and pid3 for each process in the tree (i.e. whether 0, smaller than 0 or larger than 0).

   Note that the process tree should only have one node for each process and thus the number of nodes should be equal to the number of processes.

   The process tree should be a snapshot just after all forks completed but before any process exists.

   Each line/arrow in the process tree diagram shall represent a creation of a process, or alternatively a parent/child relationship.

2. (5 points) Write a program whose main routine obtains two parameters n and d from the user, i.e. passed to your program when it was invoked from the shell. Your program shall then create an anonymous shared memory and then create a child process.

   The child process should obtain the values of n and d (you have multiple choices on how to do that) and create an arithmetic sequence of length n, and whose first element is 0 and each subsequent element has the value of kd, where k is the element number (k=0 to n-1). The child process shall store the sequence in the shared memory. (ex: if n=5 and d=2, the sequence shall be 0,2,4,6,8)

   The parent process shall wait for the child to exit and then obtain the sequence from the shared memory and print it.

   If the parent creates the child process and then creates the anonymous shared memory, would your program work? Why?

3. (5 points) Repeat part 2 except that you shall use anonymous pipes instead of shared memory to communicate between the two processes, i.e. the parent shall obtain the sequence from the pipe and print it.

What to hand in (using NYU Classes):

- Your ".c" and ".h" files (with appropriate comments).
- The answer to the question in part 2.
- A screen shot of your terminal window showing the current directory, the command used to compile your program, the command used to run your program and the output of your program.

RULES:

- You may consult with other students about GENERAL concepts or methods but copying code (or code fragments) or algorithms to solve your coding assignment is NOT ALLOWED and is considered cheating (whether copied form other students, the internet or any other source).
- If you are having trouble, please ask your teaching assistant for help.
- You must submit your assignment prior to the deadline.