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

Introduction to Operating Systems (CS-GY6233)
Spring 2021

Assignment 3
(10 points)

1. (3 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 **22**, 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. (7 points)
   a. Write a function that populates a given array of length n with a Fibonacci sequence (https://en.wikipedia.org/wiki/Fibonacci_number), where n is a integer parameter passed to the function, and an array pointer is also passed to the function. Initialize the first two elements of the array to a value of 1.

      Then create the main routine of your program, in which an integer array of length n is dynamically created, then the Fibonacci function (you just created) is called. Following that call, your program should invoke the `fork()` system call to create a child process that then prints the contents of the buffer created earlier and then exits.

      The length of the sequence `n` is obtained from the user as a parameter that is passed to your program when it started (i.e. when you invoke your program from the shell, you pass it one parameter, `n`).

      The parent process should wait for the child process to exit and then print the message “parent exiting…” .

   b. In the program you created:
   c. How did n and the populated array contents reach the child process?
   d. If the child process modifies the array contents, would the parent see those changes?

Submission file structure:

Please submit a **single .zip file** named **[Your Netid]_lab#.zip**. It shall have the following structure (replace # with the actual assignment number):

```
└── [Your Netid] hw# (Single folder includes all your submissions)
    ├── lab#_1.c (Source code for problem 1)
    ├── lab#_2a.c (Source code for problem 2a, and so on)
    ├── lab#_1.h (Source code header file, if any)
    ├── Makefile (makefile used to build your program, if any)
    ├── lab#.pdf (images + Report/answers to short-answer questions)
```

What to hand in (using NYU Classes):

- Source file(s) named as described above.
- A .pdf file named **"lab3.pdf"**, containing:
  - Screen shot(**s**) 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.
  - Answers to H/W questions

RULES:

- You shall **use kernel version 4.x.x or above**. You shall not use kernel version 3.x.x.
- You may consult with other students about GENERAL concepts or methods but copying code (or code fragments) or algorithms 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.