George Suarez

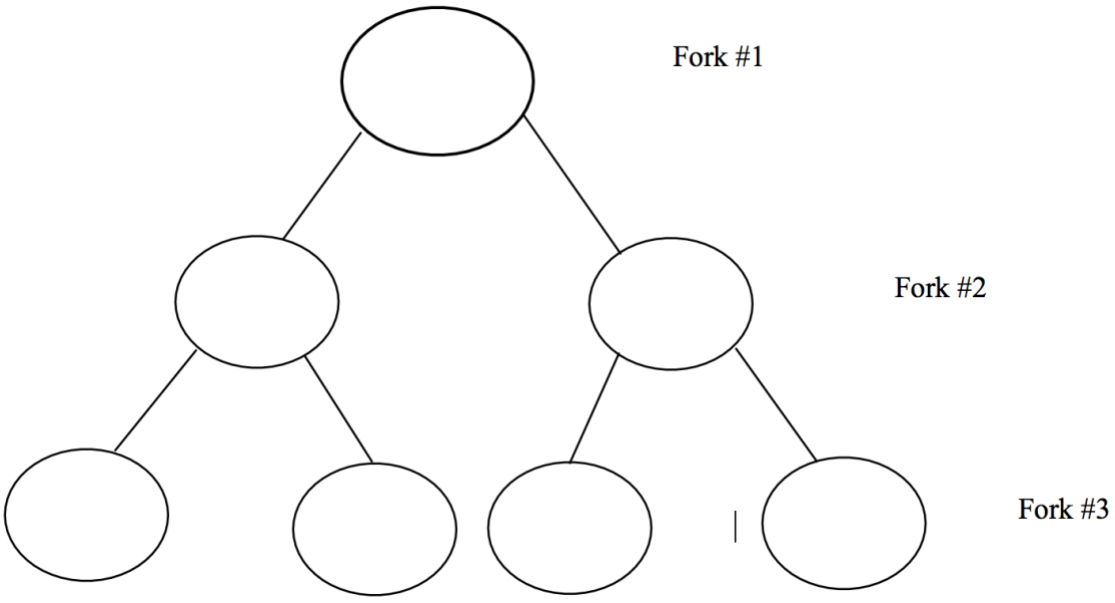
CSE 460

Homework 1

1. How many processes does the following piece of code create? Why?

```
int main()
{
  fork();
  fork();
  fork();
  return 0;
}
```

- The following code creates 8 processes because each fork that is being called doubles the amount of the current process including the original process. So, we can say that each fork call creates 2^n processes where n equals to the number of times fork is being called. The following tree represents this behavior.



2.

a. Write a C/C++-program that creates a chain of 10 processes and prints out their process ids and relationships. For example, process 1 is the parent of process 2, process 2 is the parent of process 3, process 3 is the parent of 4 and so on. Each child has to print out all her ancestors identified by the process ids.

chain_processes.cpp:

```
#include <iostream>
#include <unistd.h>

using namespace std;

int main()
{
   pid_t pid = fork();

   for (int i = 0; i < 10; ++i)
   {
      if (pid == 0)
      {
                  cout << "This is a child with PID: " << getpid() << ". My Parent PID is:       " << getppid() << endl;
         pid = fork();
      }
           else
      {
         wait(0);
      }
   }
   return 0;
}
```

Output:

```
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./chain_processes
This is a child with PID: 45122. My Parent PID is: 45122
This is a child with PID: 45123. My Parent PID is: 45123
This is a child with PID: 45124. My Parent PID is: 45124
This is a child with PID: 45125. My Parent PID is: 45125
This is a child with PID: 45126. My Parent PID is: 45126
This is a child with PID: 45127. My Parent PID is: 45127
This is a child with PID: 45128. My Parent PID is: 45128
```

```
This is a child with PID: 45129. My Parent PID is: 45129
This is a child with PID: 45130. My Parent PID is: 45130
This is a child with PID: 45131. My Parent PID is: 45131
```

b. Write a C/C++-program that creates a fan of 10 processes. That is, process 1 is the parent of processes 2, 3, 4, 5, 6 and so on.

fan_processes.cpp:

```
#include <iostream>
#include <unistd.h>

using namespace std;

int main()
{
   pid_t parent_pid = getpid();

   cout << "Parent PID: " << parent_pid << endl;

   pid_t pid = fork();

   for (int i = 0; i < 10; i++)
   {
      if (pid > 0) // Parent process
      {
         pid = fork();
         if (pid == 0)
         {
            cout << "I am child process and my PID is: " << getpid() << " and my parent PID is: " << getppid() << endl;
         }
         else
         {
            wait(0);
         }
      }
   }
   return 0;
}
~
```

Output:

```
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./fan_processes
Parent PID: 45187
I am child process and my PID is: 45189 and my parent PID is: 45187
I am child process and my PID is: 45190 and my parent PID is: 45187
I am child process and my PID is: 45191 and my parent PID is: 45187
I am child process and my PID is: 45192 and my parent PID is: 45187
I am child process and my PID is: 45193 and my parent PID is: 45187
I am child process and my PID is: 45194 and my parent PID is: 45187
I am child process and my PID is: 45195 and my parent PID is: 45187
I am child process and my PID is: 45196 and my parent PID is: 45187
I am child process and my PID is: 45197 and my parent PID is: 45187
I am child process and my PID is: 45198 and my parent PID is: 45187
```

3.

a. Write a simple program named **test1.cpp**, which contains an infinite **while** loop. Compile the program to an executable named **test1** and run it in the background.

test1.cpp:

```
#include <iostream>

using namespace std;

int main()
{
  int x = 0;

  while (1)
  {
    ++x;
  }
 return 0;
}
```

Output:

```
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./test1 &
[1] 45266
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./test1 &
[2] 45277
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./test1 &
[3] 45288
```

b. Write a shell script that searches for whether the process **test1** is in the system. If it is not, your script displays the message 'Process test1 not running!'. If it is running, your script kills the process, and displays the message 'Process test1 killed!'.

terminateProcess:

```
for pid in $(ps -e -f | grep $1 | grep -v grep | grep -v $0 | awk '{print $2}')
do
        kill $pid
done

if [ "$pid" == "" ];
then
        echo "Process $1 is not running!"
else
        echo "Process $1 killed!"
fi
```

Output:

```
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./terminateProcess test1
Process test1 killed!
[1]   Terminated: 15          ./test1
[2]-  Terminated: 15          ./test1
[3]+  Terminated: 15          ./test1
georgesuarez at MacBook-Pro in ~/University/CSE-460/Homework/Homework 1 on master*
$ ./terminateProcess test1
Process test1 is not running!
```