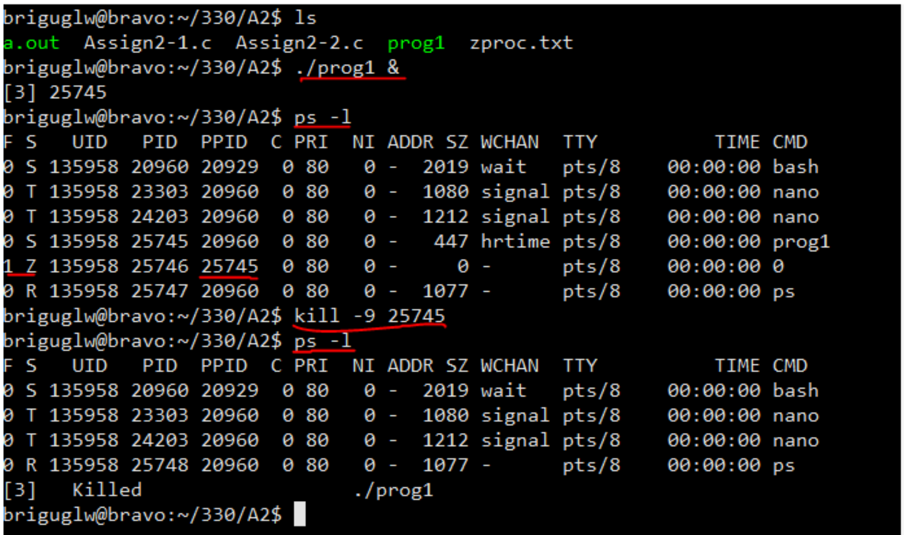
I confirm that I will keep the content of this assignment confidential. I confirm that I have not received any unauthorized assistance in preparing for or writing this assignment. I acknowledge that a mark of 0 may be assigned for copied work. William Briguglio 104 205 372

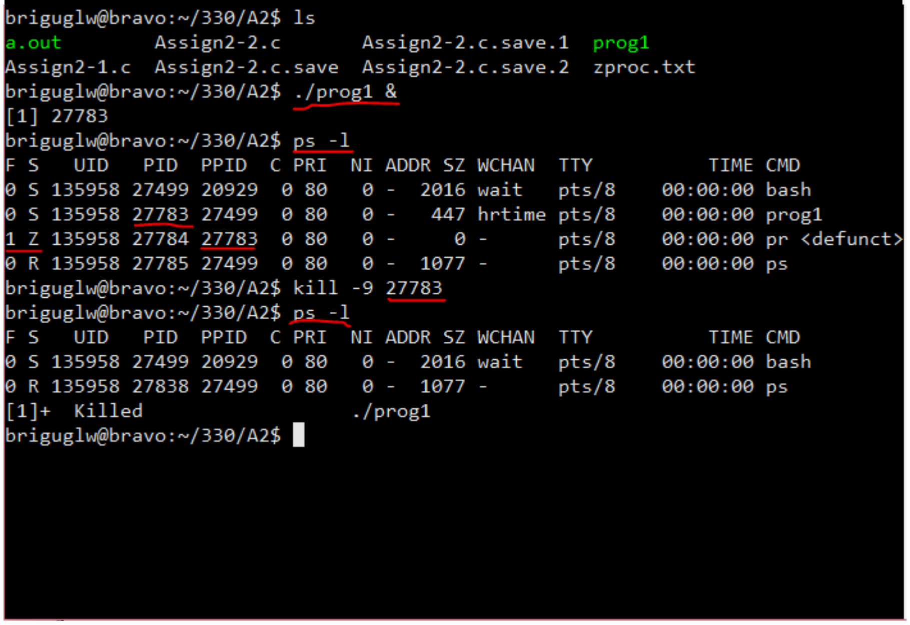
Task 1)

For Task 1 my C program is called Assign2-1.c and compiled into an executable called prog1. It creates a child which does nothing and therefore exits immediately, and the parent process sleeps for 20 seconds before the wait(); function is called, thus creating a zombie process out of the child that exists for 20 seconds. There are no inputs, or outputs. The user must manually enter ps -l to obtain the zombie processes PPID and then enter kill -9 [PPID] to kill the zombie process.

Following are two screen shots of my programs complete execution.



```
briguglw@bravo:~/330/A2$ ls
a.out  Assign2-1.c  Assign2-2.c  prog1  zproc.txt
briguglw@bravo:~/330/A2$ ./prog1 &
[3] 25745
briguglw@bravo:~/330/A2$ ps -l
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 20960 20929  0 80   0 -  2019 wait   pts/8    00:00:00 bash
0 T 135958 23303 20960  0 80   0 -  1080 signal pts/8    00:00:00 nano
0 T 135958 24203 20960  0 80   0 -  1212 signal pts/8    00:00:00 nano
0 S 135958 25745 20960  0 80   0 -   447 hrtime pts/8    00:00:00 prog1
1 Z 135958 25746 25745  0 80   0 -     0 -      pts/8    00:00:00 0
0 R 135958 25747 20960  0 80   0 -  1077 -      pts/8    00:00:00 ps
briguglw@bravo:~/330/A2$ kill -9 25745
briguglw@bravo:~/330/A2$ ps -l
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 20960 20929  0 80   0 -  2019 wait   pts/8    00:00:00 bash
0 T 135958 23303 20960  0 80   0 -  1080 signal pts/8    00:00:00 nano
0 T 135958 24203 20960  0 80   0 -  1212 signal pts/8    00:00:00 nano
0 R 135958 25748 20960  0 80   0 -  1077 -      pts/8    00:00:00 ps
[3]   Killed                  ./prog1
briguglw@bravo:~/330/A2$ 
```

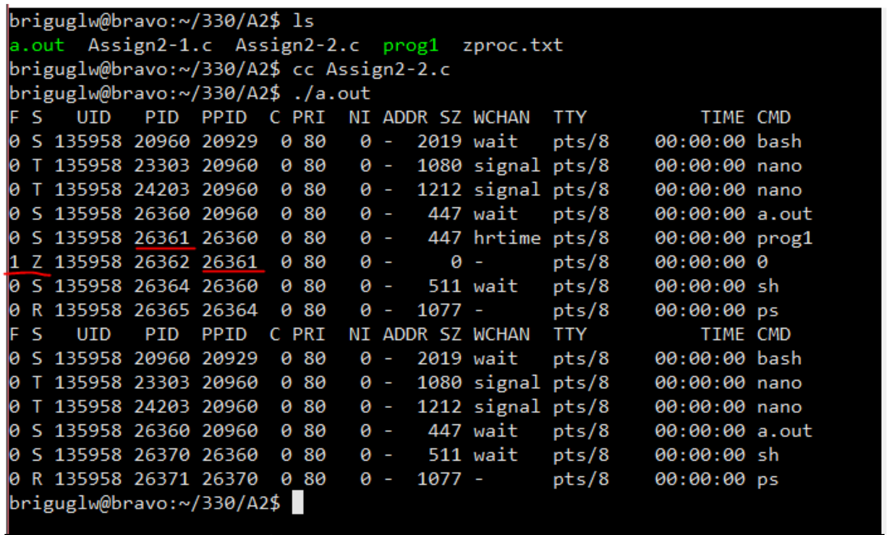


```
briguglw@bravo:~/330/A2$ ls
a.out        Assign2-2.c       Assign2-2.c.save.1  prog1
Assign2-1.c  Assign2-2.c.save  Assign2-2.c.save.2  zproc.txt
briguglw@bravo:~/330/A2$ ./prog1 &
[1] 27783
briguglw@bravo:~/330/A2$ ps -l
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 27499 20929  0 80   0 -  2016 wait   pts/8    00:00:00 bash
0 S 135958 27783 27499  0 80   0 -   447 hrtime pts/8    00:00:00 prog1
1 Z 135958 27784 27783  0 80   0 -     0 -      pts/8    00:00:00 pr <defunct>
0 R 135958 27785 27499  0 80   0 -  1077 -      pts/8    00:00:00 ps
briguglw@bravo:~/330/A2$ kill -9 27783
briguglw@bravo:~/330/A2$ ps -l
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 27499 20929  0 80   0 -  2016 wait   pts/8    00:00:00 bash
0 R 135958 27838 27499  0 80   0 -  1077 -      pts/8    00:00:00 ps
[1]+  Killed                  ./prog1
briguglw@bravo:~/330/A2$ 
```

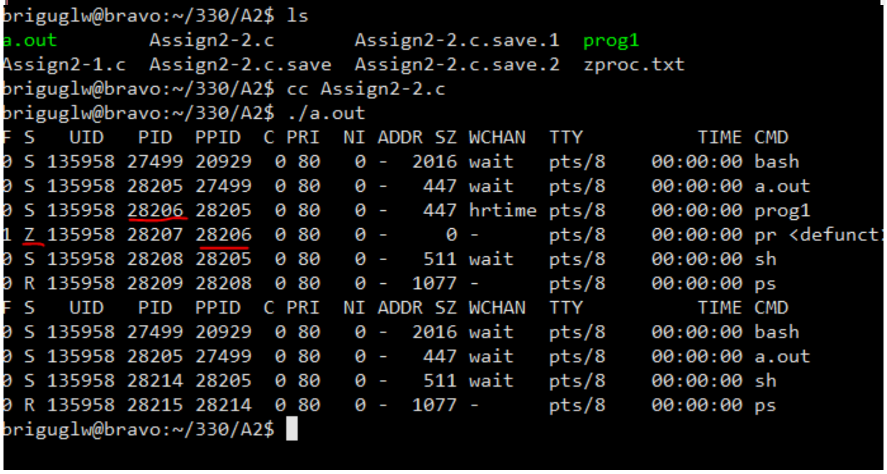
Task 2)

For task 2 my C program called Assign2-2.c begins by forking and creating a new process. In the child process **`execl();`** is called to execute my C program from Task 1 and create a zombie process. In the parent process the program calls displays the running processes using **ps -l** . Then calls **ps -l | grep ' Z ' > zproc.txt** which saves only the rows from the output of the **ps -l** call that contain ' Z ' (and therefore are the rows containing the details of the zombie processes only) into a file called zproc.txt. The program then locates the forth column from in each row and copies the contents of said column(which is the PPID of the zombie process) into the appropriate location in the string **kill -9** forming the correct command **kill -9 [PPID]** that is then called by the program. **ps -l** is calls once more to display the updated list running processes and the program exits

Following are two screen shots of my programs complete execution.



```
briguglw@bravo:~/330/A2$ ls
a.out  Assign2-1.c  Assign2-2.c  prog1  zproc.txt
briguglw@bravo:~/330/A2$ cc Assign2-2.c
briguglw@bravo:~/330/A2$ ./a.out
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 20960 20929  0 80   0 -  2019 wait   pts/8    00:00:00 bash
0 T 135958 23303 20960  0 80   0 -  1080 signal pts/8    00:00:00 nano
0 T 135958 24203 20960  0 80   0 -  1212 signal pts/8    00:00:00 nano
0 S 135958 26360 20960  0 80   0 -   447 wait   pts/8    00:00:00 a.out
0 S 135958 26361 26360  0 80   0 -   447 hrtime pts/8    00:00:00 prog1
1 Z 135958 26362 26361  0 80   0 -     0 -      pts/8    00:00:00 0
0 S 135958 26364 26360  0 80   0 -   511 wait   pts/8    00:00:00 sh
0 R 135958 26365 26364  0 80   0 -  1077 -      pts/8    00:00:00 ps
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 20960 20929  0 80   0 -  2019 wait   pts/8    00:00:00 bash
0 T 135958 23303 20960  0 80   0 -  1080 signal pts/8    00:00:00 nano
0 T 135958 24203 20960  0 80   0 -  1212 signal pts/8    00:00:00 nano
0 S 135958 26360 20960  0 80   0 -   447 wait   pts/8    00:00:00 a.out
0 S 135958 26370 26360  0 80   0 -   511 wait   pts/8    00:00:00 sh
0 R 135958 26371 26370  0 80   0 -  1077 -      pts/8    00:00:00 ps
briguglw@bravo:~/330/A2$ 
```



```
briguglw@bravo:~/330/A2$ ls
a.out        Assign2-2.c       Assign2-2.c.save.1  prog1
Assign2-1.c  Assign2-2.c.save  Assign2-2.c.save.2  zproc.txt
briguglw@bravo:~/330/A2$ cc Assign2-2.c
briguglw@bravo:~/330/A2$ ./a.out
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 27499 20929  0 80   0 -  2016 wait   pts/8    00:00:00 bash
0 S 135958 28205 27499  0 80   0 -   447 wait   pts/8    00:00:00 a.out
0 S 135958 28206 28205  0 80   0 -   447 hrtime pts/8    00:00:00 prog1
1 Z 135958 28207 28206  0 80   0 -     0 -      pts/8    00:00:00 pr <defunct
0 S 135958 28208 28205  0 80   0 -   511 wait   pts/8    00:00:00 sh
0 R 135958 28209 28208  0 80   0 -  1077 -      pts/8    00:00:00 ps
F S   UID   PID  PPID  C PRI  NI ADDR SZ WCHAN  TTY          TIME CMD
0 S 135958 27499 20929  0 80   0 -  2016 wait   pts/8    00:00:00 bash
0 S 135958 28205 27499  0 80   0 -   447 wait   pts/8    00:00:00 a.out
0 S 135958 28214 28205  0 80   0 -   511 wait   pts/8    00:00:00 sh
0 R 135958 28215 28214  0 80   0 -  1077 -      pts/8    00:00:00 ps
briguglw@bravo:~/330/A2$ 
```