Aaron Jones

Lab 4

10/15/14

CSCD 240
Lab 4

Note: You have to complete this lab by ssh login into cslinux.eastern.ewu.edu.
Turn in on Canvas □ Assignments □ Lab4
In **question 1 through 6,** you should capture the prompt, the command, and the output from the command.

1) What is the difference between a shell variable and an environment variable in the bash shell?

   The difference between a shell variable and an environment variable in the bash shell is that a shell variable is a local variable valid in the current shell while an environment variable is valid systemwide.

2) Define what a process is and what a job is, clearly explain how jobs differ from processes.

   A process is any program running with it's own address space, while a job is a program within the shell that you interact with and doesn't detach.

3) Consider the following command ls – al | less.

   a. How many processes are created with that command?
      Two
   b. What exactly does “|” do in this command?
      The “|” is called a pipe in which it connects the standard output of one command with the standard input of another.

1) Using the man page for **ps**
   a. Issue and capture the **ps** command with the appropriate options to allow listing of all processes in the system.

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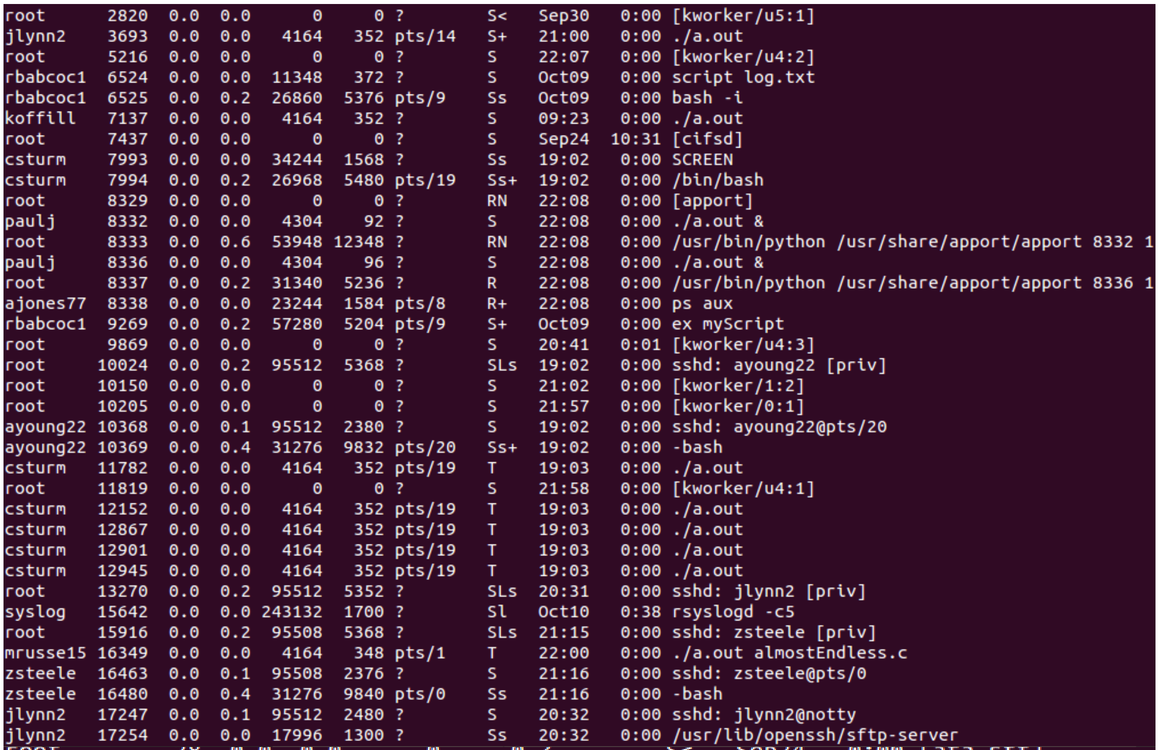
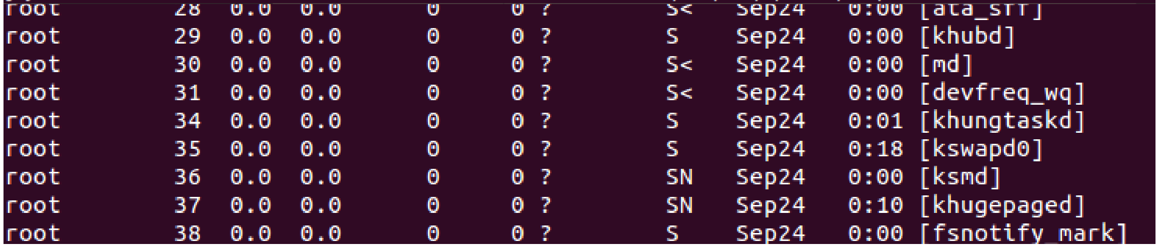


```
root      2820  0.0  0.0      0     0 ?        S<   Sep30   0:00 [kworker/u5:1]
jlynn2    3693  0.0  0.0   4164   352 pts/14   S+   21:00   0:00 ./a.out
root      5216  0.0  0.0      0     0 ?        S    22:07   0:00 [kworker/u4:2]
rbabcoc1  6524  0.0  0.0  11348   372 ?        S    Oct09   0:00 script log.txt
rbabcoc1  6525  0.0  0.2  26860  5376 pts/9    Ss   Oct09   0:00 bash -i
koffill   7137  0.0  0.0   4164   352 ?        S    09:23   0:00 ./a.out
root      7437  0.0  0.0      0     0 ?        S    Sep24  10:31 [cifsd]
csturm    7993  0.0  0.0  34244  1568 ?        Ss   19:02   0:00 SCREEN
csturm    7994  0.0  0.2  26968  5480 pts/19   Ss+  19:02   0:00 /bin/bash
root      8329  0.0  0.0      0     0 ?        RN   22:08   0:00 [apport]
paulj     8332  0.0  0.0   4304    92 ?        S    22:08   0:00 ./a.out &
root      8333  0.0  0.6  53948 12348 ?        RN   22:08   0:00 /usr/bin/python /usr/share/apport/apport 8332 1
paulj     8336  0.0  0.0   4304    96 ?        S    22:08   0:00 ./a.out &
root      8337  0.0  0.2  31340  5236 ?        R    22:08   0:00 /usr/bin/python /usr/share/apport/apport 8336 1
ajones77  8338  0.0  0.0  23244  1584 pts/8    R+   22:08   0:00 ps aux
rbabcoc1  9269  0.0  0.2  57280  5204 pts/9    S+   Oct09   0:00 ex myScript
root      9869  0.0  0.0      0     0 ?        S    20:41   0:01 [kworker/u4:3]
root     10024  0.0  0.2  95512  5368 ?        SLs  19:02   0:00 sshd: ayoung22 [priv]
root     10150  0.0  0.0      0     0 ?        S    21:02   0:00 [kworker/1:2]
root     10205  0.0  0.0      0     0 ?        S    21:57   0:00 [kworker/0:1]
ayoung22 10368  0.0  0.1  95512  2380 ?        S    19:02   0:00 sshd: ayoung22@pts/20
ayoung22 10369  0.0  0.4  31276  9832 pts/20   Ss+  19:02   0:00 -bash
csturm   11782  0.0  0.0   4164   352 pts/19   T    19:03   0:00 ./a.out
root     11819  0.0  0.0      0     0 ?        S    21:58   0:00 [kworker/u4:1]
csturm   12152  0.0  0.0   4164   352 pts/19   T    19:03   0:00 ./a.out
csturm   12867  0.0  0.0   4164   352 pts/19   T    19:03   0:00 ./a.out
csturm   12901  0.0  0.0   4164   352 pts/19   T    19:03   0:00 ./a.out
csturm   12945  0.0  0.0   4164   352 pts/19   T    19:03   0:00 ./a.out
root     13270  0.0  0.2  95512  5352 ?        SLs  20:31   0:00 sshd: jlynn2 [priv]
syslog   15642  0.0  0.0 243132  1700 ?        Sl   Oct10   0:38 rsyslogd -c5
root     15916  0.0  0.2  95508  5368 ?        SLs  21:15   0:00 sshd: zsteele [priv]
mrusse15 16349  0.0  0.0   4164   348 pts/1    T    22:00   0:00 ./a.out almostEndless.c
zsteele  16463  0.0  0.1  95508  2376 ?        S    21:16   0:00 sshd: zsteele@pts/0
zsteele  16480  0.0  0.4  31276  9840 pts/0    Ss   21:16   0:00 -bash
jlynn2   17247  0.0  0.1  95512  2480 ?        S    20:32   0:00 sshd: jlynn2@notty
jlynn2   17254  0.0  0.0  17996  1300 ?        Ss   20:32   0:00 /usr/lib/openssh/sftp-server
```



```
root        28  0.0  0.0      0     0 ?        S<   Sep24   0:00 [ata_sff]
root        29  0.0  0.0      0     0 ?        S    Sep24   0:00 [khubd]
root        30  0.0  0.0      0     0 ?        S<   Sep24   0:00 [md]
root        31  0.0  0.0      0     0 ?        S<   Sep24   0:00 [devfreq_wq]
root        34  0.0  0.0      0     0 ?        S    Sep24   0:01 [khungtaskd]
root        35  0.0  0.0      0     0 ?        S    Sep24   0:18 [kswapd0]
root        36  0.0  0.0      0     0 ?        SN   Sep24   0:00 [ksmd]
root        37  0.0  0.0      0     0 ?        SN   Sep24   0:10 [khugepaged]
root        38  0.0  0.0      0     0 ?        S    Sep24   0:00 [fsnotify_mark]
```

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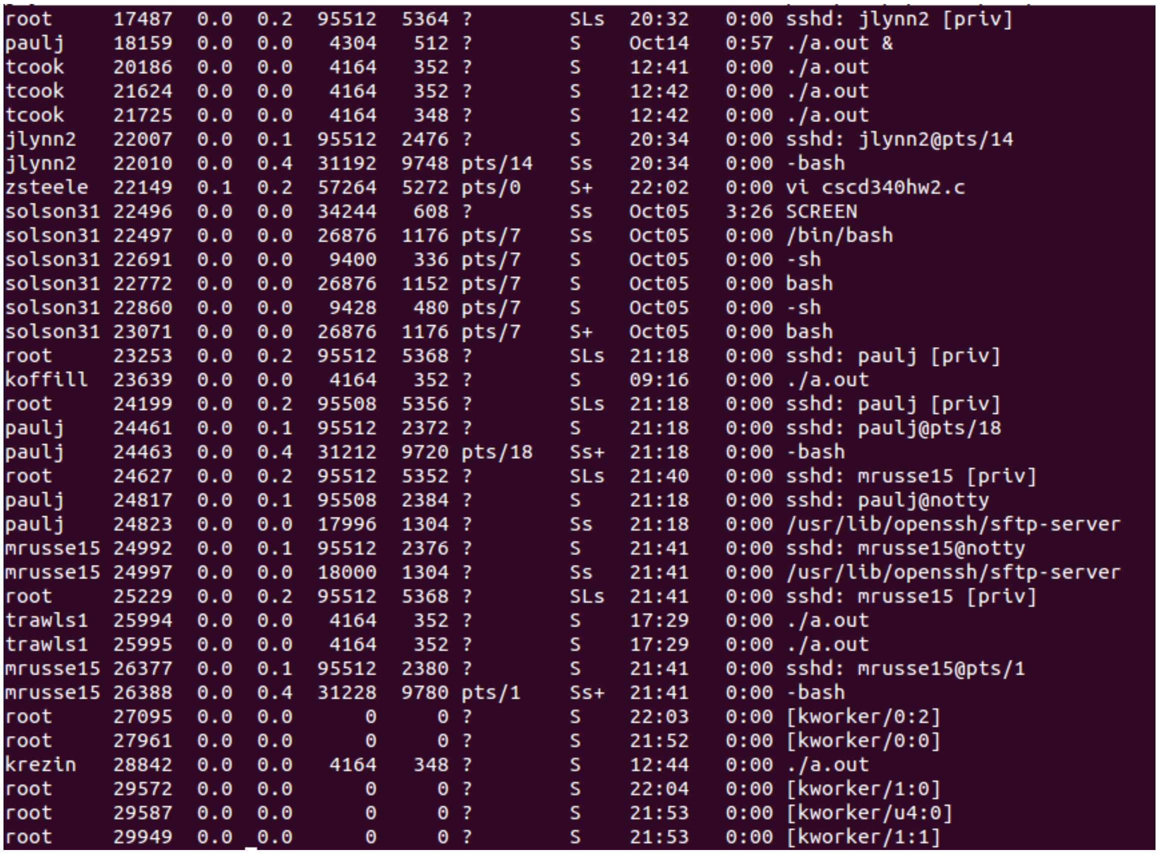

```
root      17487  0.0  0.2  95512  5364 ?        SLs  20:32   0:00 sshd: jlynn2 [priv]
paulj     18159  0.0  0.0   4304   512 ?        S    Oct14   0:57 ./a.out &
tcook     20186  0.0  0.0   4164   352 ?        S    12:41   0:00 ./a.out
tcook     21624  0.0  0.0   4164   352 ?        S    12:42   0:00 ./a.out
tcook     21725  0.0  0.0   4164   348 ?        S    12:42   0:00 ./a.out
jlynn2    22007  0.0  0.1  95512  2476 ?        S    20:34   0:00 sshd: jlynn2@pts/14
jlynn2    22010  0.0  0.4  31192  9748 pts/14   Ss   20:34   0:00 -bash
zsteele   22149  0.1  0.2  57264  5272 pts/0    S+   22:02   0:00 vi cscd340hw2.c
solson31 22496  0.0  0.0  34244   608 ?        Ss   Oct05   3:26 SCREEN
solson31 22497  0.0  0.0  26876  1176 pts/7    Ss   Oct05   0:00 /bin/bash
solson31 22691  0.0  0.0   9400   336 pts/7    S    Oct05   0:00 -sh
solson31 22772  0.0  0.0  26876  1152 pts/7    S    Oct05   0:00 bash
solson31 22860  0.0  0.0   9428   480 pts/7    S    Oct05   0:00 -sh
solson31 23071  0.0  0.0  26876  1176 pts/7    S+   Oct05   0:00 bash
root      23253  0.0  0.2  95512  5368 ?        SLs  21:18   0:00 sshd: paulj [priv]
koffill   23639  0.0  0.0   4164   352 ?        S    09:16   0:00 ./a.out
root      24199  0.0  0.2  95508  5356 ?        SLs  21:18   0:00 sshd: paulj [priv]
paulj     24461  0.0  0.1  95512  2372 ?        S    21:18   0:00 sshd: paulj@pts/18
paulj     24463  0.0  0.4  31212  9720 pts/18   Ss+  21:18   0:00 -bash
root      24627  0.0  0.2  95512  5352 ?        SLs  21:40   0:00 sshd: mrusse15 [priv]
paulj     24817  0.0  0.1  95508  2384 ?        S    21:18   0:00 sshd: paulj@notty
paulj     24823  0.0  0.0  17996  1304 ?        Ss   21:18   0:00 /usr/lib/openssh/sftp-server
mrusse15 24992  0.0  0.1  95512  2376 ?        S    21:41   0:00 sshd: mrusse15@notty
mrusse15 24997  0.0  0.0  18000  1304 ?        Ss   21:41   0:00 /usr/lib/openssh/sftp-server
root      25229  0.0  0.2  95512  5368 ?        SLs  21:41   0:00 sshd: mrusse15 [priv]
trawls1   25994  0.0  0.0   4164   352 ?        S    17:29   0:00 ./a.out
trawls1   25995  0.0  0.0   4164   352 ?        S    17:29   0:00 ./a.out
mrusse15 26377  0.0  0.1  95512  2380 ?        S    21:41   0:00 sshd: mrusse15@pts/1
mrusse15 26388  0.0  0.4  31228  9780 pts/1    Ss+  21:41   0:00 -bash
root      27095  0.0  0.0      0     0 ?        S    22:03   0:00 [kworker/0:2]
root      27961  0.0  0.0      0     0 ?        S    21:52   0:00 [kworker/0:0]
krezin    28842  0.0  0.0   4164   348 ?        S    12:44   0:00 ./a.out
root      29572  0.0  0.0      0     0 ?        S    22:04   0:00 [kworker/1:0]
root      29587  0.0  0.0      0     0 ?        S    21:53   0:00 [kworker/u4:0]
root      29949  0.0  0.0      0     0 ?        S    21:53   0:00 [kworker/1:1]
```

a. Using the output from part A, what was the first process started and by whom was it started?
   The first command was issued by root with the PID of 1, the command being /sbin/init/.
b. What was the first non-root process that was started?
   The first non-root process was dbus-daemon --system --fork –activation=upstart by 102.
c. What was the last process started and by whom?
   The last process was started by root, running the command kworker.

2) Using a text editor create the following C programmed named almostEndless.c

```
#include <stdio.h>

int main()
```

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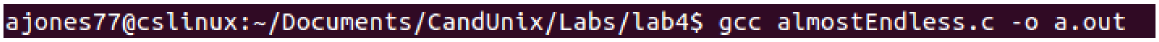
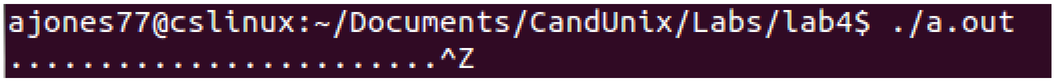
```
{




    int x = 0;
        while(x < 20000000)
        {
              printf("..");
              fflush(stdout);
              sleep(3);
              x ++;
        }// end while

        return 0;
}// end main
```

a. Compile your program with gcc almostEndless.c



```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ gcc almostEndless.c -o a.out
```

b. Start your program with ./a.out



```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ ./a.out
........................^Z
```

c. With your program running, describe the commands you would use (without using ctrl-c) to terminate that program, from the same terminal window in which it was started.

I would use ctrl+z to suspend the program, then us ps -u myUsername to find out what the PID is and then use that PID with the kill command with the option -9 to terminate the program.

d. Execute and capture the commands, using process notation (PID), to terminate a.out

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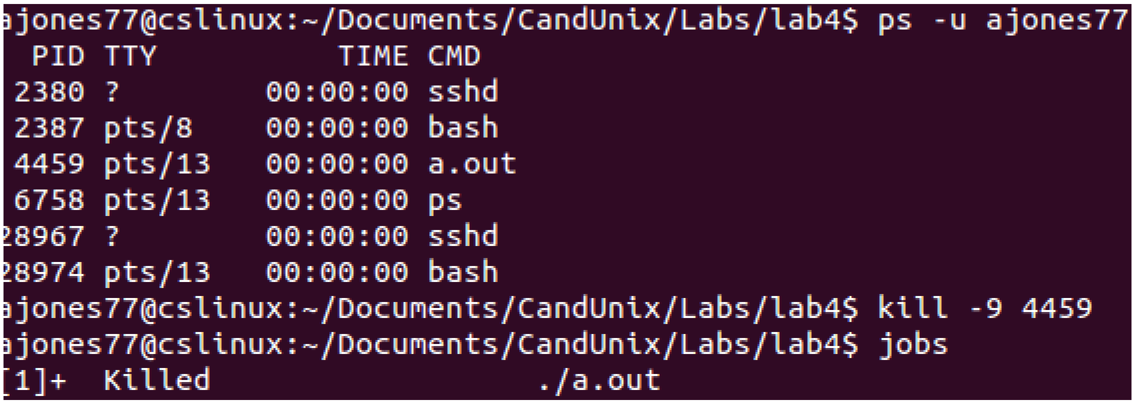
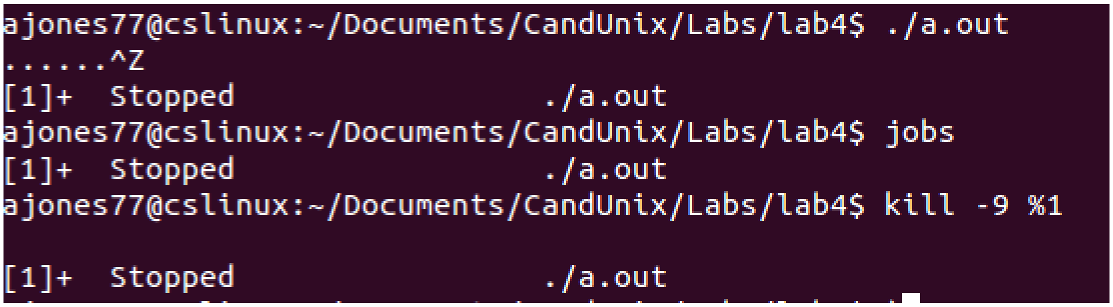


```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ ps -u ajones77
  PID TTY          TIME CMD
 2380 ?        00:00:00 sshd
 2387 pts/8    00:00:00 bash
 4459 pts/13   00:00:00 a.out
 6758 pts/13   00:00:00 ps
28967 ?        00:00:00 sshd
28974 pts/13   00:00:00 bash
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ kill -9 4459
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ jobs
[1]+  Killed                  ./a.out
```

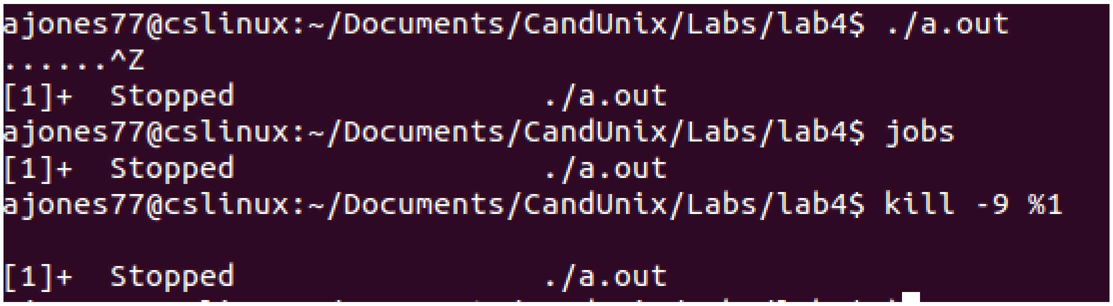
e. Restart your program with ./a.out



```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ ./a.out
......^Z
[1]+  Stopped                 ./a.out
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ jobs
[1]+  Stopped                 ./a.out
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ kill -9 %1

[1]+  Stopped                 ./a.out
```

f. Execute and capture the commands, using job notation (job ID), to terminate a.out



```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ ./a.out
......^Z
[1]+  Stopped                 ./a.out
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ jobs
[1]+  Stopped                 ./a.out
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ kill -9 %1

[1]+  Stopped                 ./a.out
```

1) In a single terminal window capture the command to start a.out 3 times each running as background jobs: **(Hint**: **redirection** is useful here)

   a. What are the job numbers of the above?

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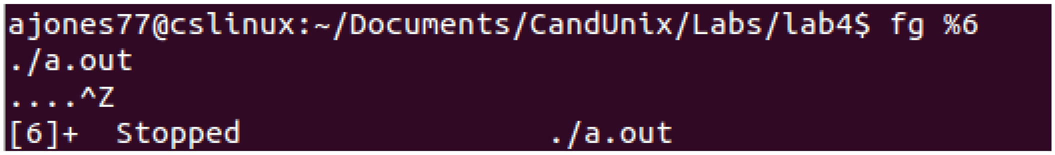
5, 6, 7

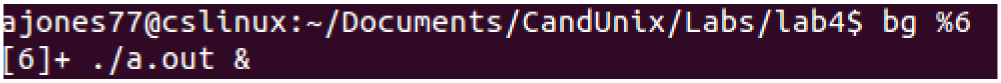
b. What are the process ID numbers of the above?
2320, 2321, 2322

c. Capture the command and output to bring the second a.out to the foreground.



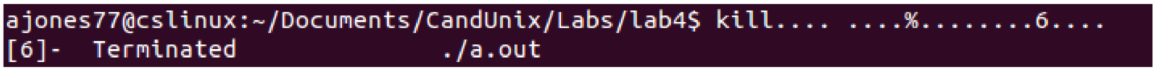
```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ fg %6
./a.out
....^Z
[6]+  Stopped                 ./a.out
```

d. Capture the command(s) to send a.out back to the background.



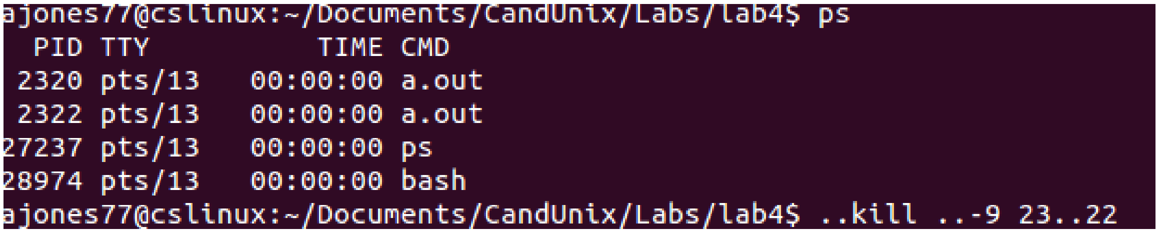
```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ bg %6
[6]+ ./a.out &
```

e. Capture the command(s) to kill the third a.out using its job number.



```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ kill.... ....%........6....
[6]-  Terminated              ./a.out
```

f. Capture the command(s) to kill the first a.out using its process number.



```
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ ps
  PID TTY          TIME CMD
 2320 pts/13   00:00:00 a.out
 2322 pts/13   00:00:00 a.out
27237 pts/13   00:00:00 ps
28974 pts/13   00:00:00 bash
ajones77@cslinux:~/Documents/CandUnix/Labs/lab4$ ..kill ..-9 23..22
```

g. Can CTRL C be used to kill any job? Why or why not? Clearly explain why or why not.

CTRL + C cannot be used to kill any job because they are running in the background.