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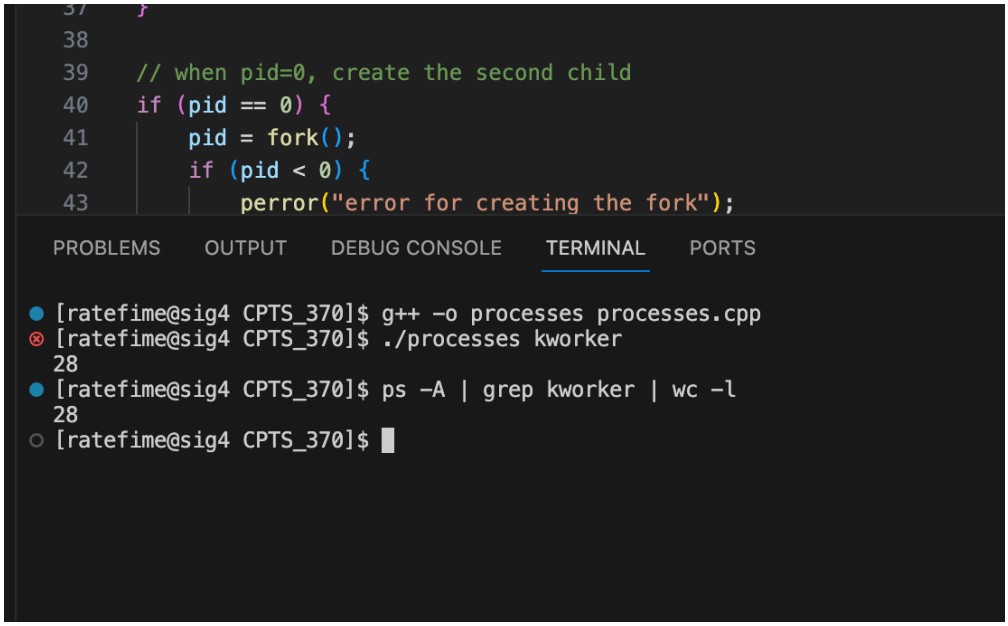
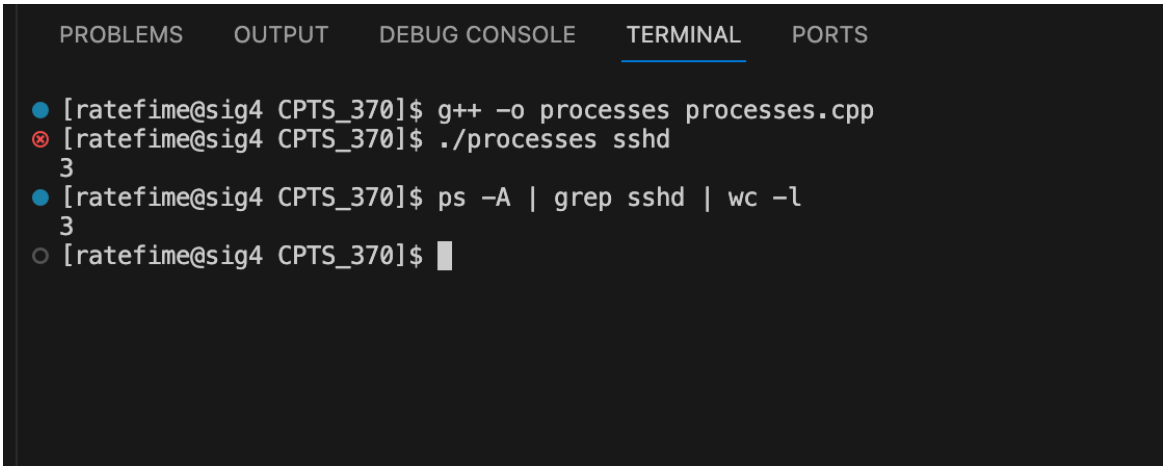
Program 1

1) I uploaded the processes.cpp file separately on the Canvas.

2)





3) This program counts the number of running processor on the device by giving the name which is argv[1]. First I created a new processor with fork(). Then I created two pipes which is pip1 and pip2. I used pip1 for ps to grep and pip2 for grep to wc -l. Then I started with checking the fork. If pid<0 we will get the fork error. According to the assignment table first I created the parent to wait for a child. Then I created the if loop for creating child and grandchild when pid == 0. So, I created the child (wc -l). In this step I close the writing in pip2, pip1, and duplicate the reading from pip2. Then executes the command wc -l. Second, I created the grandchild. In this step, I delete the reading from pip2 and writing from pip1 and duplicate the reading from pip1 and writing from pip2. Then I execute grep command with given argv[1]. Then I created the great grand child. In here, I only duplicate the writing in pip1 and then execute the ps -A command. Finally I was able to compile my program with g++ -o processes processes.cpp and then run it with ./processes kworker. I got the same output as if I run it with ps -A| grep kworker| wc -l.