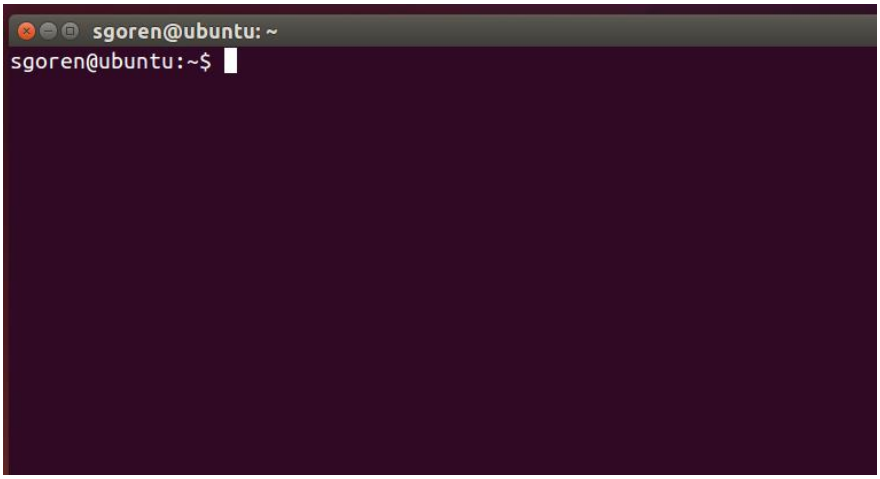
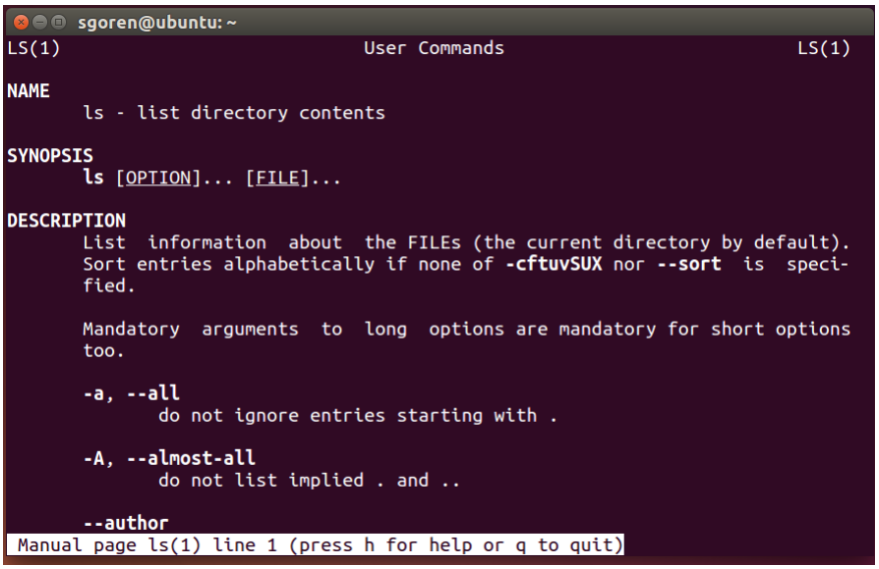
**CSE 101 - Computer Engineering Concepts & Algorithms (2020 Fall)**

**LAB#1 - LINUX BASICs**

1- Open a terminal.




2- Open manual page of command "ls". Type "man ls"




3- Type "ls" to see directory contents.

4- Make a directory by typing "mkdir lab1"

5- Do "ls" again.

6- Change your current directory to lab1 by typing "cd lab1" and do "ls -al"

```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:~$ man ls
sgoren@ubuntu:~$ man cd
No manual entry for cd
sgoren@ubuntu:~$ ls
BEAGLEBONE     Desktop      encrypt          Music     ROCOCO.tar.gz   tmp
CPU            Documents    EncryptProject   Pictures  ROCOCO.zip.old  Videos
CSE101-Python  Downloads    examples.desktop Public    sil
cse222         encrpyt_old  FaultEmuProject  ROCOCO    Templates
sgoren@ubuntu:~$ mkdir lab1
sgoren@ubuntu:~$ ls
BEAGLEBONE     Documents       examples.desktop  Public          Templates
CPU            Downloads       FaultEmuProject   ROCOCO          tmp
CSE101-Python  encrpyt_old     lab1              ROCOCO.tar.gz   Videos
cse222         encrypt         Music             ROCOCO.zip.old
Desktop        EncryptProject  Pictures          sil
sgoren@ubuntu:~$ cd lab1
sgoren@ubuntu:~/lab1$ ls
sgoren@ubuntu:~/lab1$ ls -al
total 8
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 15:47 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
sgoren@ubuntu:~/lab1$
```

7- Open the manual page for command “tee”.

```
sgoren@ubuntu: ~/lab1
TEE(1)                          User Commands                          TEE(1)

NAME
       tee - read from standard input and write to standard output and files

SYNOPSIS
       tee [OPTION]... [FILE]...

DESCRIPTION
       Copy standard input to each FILE, and also to standard output.

       -a, --append
              append to the given FILEs, do not overwrite

       -i, --ignore-interrupts
              ignore interrupt signals

       --help display this help and exit

       --version
              output version information and exit

       If a FILE is -, copy again to standard output.
 Manual page tee(1) line 1 (press h for help or q to quit)
```

8- Create a file called hello.txt and by typing “tee hello.txt” and press enter, then type “Hello from my first text file” and then type “Ctrl-D”.

9- Do “ls -al” to see whether you created a file or not. To see the contents of your file type “more hello.txt”. Do “man more” to open the man page.

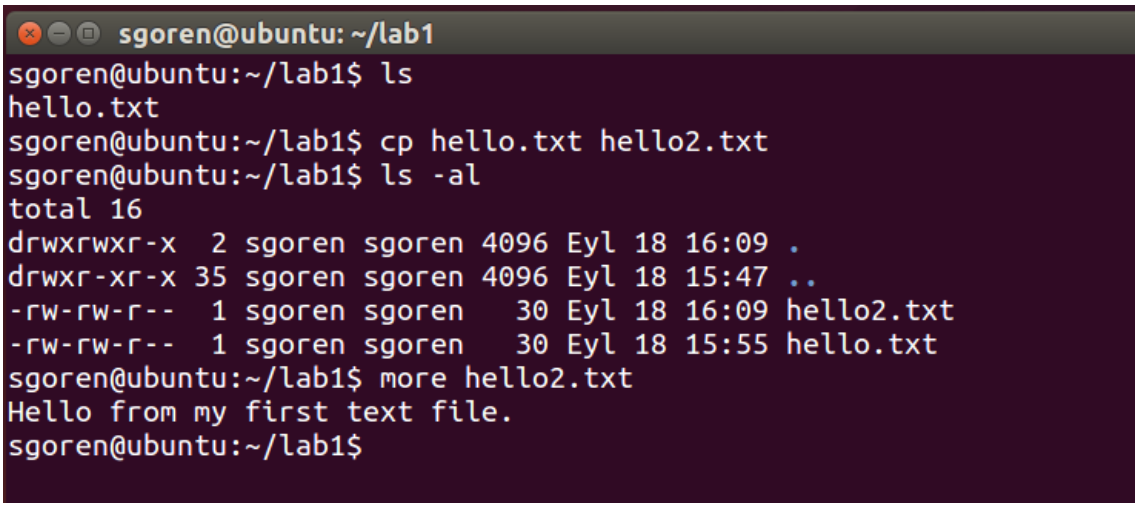
```
sgoren@ubuntu: ~/lab1
BEAGLEBONE     Documents       examples.desktop  Public          Templates
CPU            Downloads       FaultEmuProject   ROCOCO          tmp
CSE101-Python  encrpyt_old     lab1              ROCOCO.tar.gz   Videos
cse222         encrypt         Music             ROCOCO.zip.old
Desktop        EncryptProject  Pictures          sil
sgoren@ubuntu:~$ cd lab1
sgoren@ubuntu:~/lab1$ ls
sgoren@ubuntu:~/lab1$ ls -al
total 8
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 15:47 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
sgoren@ubuntu:~/lab1$ man tee
sgoren@ubuntu:~/lab1$ tee hello.txt
Hello from my first text file.Hello from my first text file.sgoren@ubuntu:~/lab1
$ ls
hello.txt
sgoren@ubuntu:~/lab1$ more hello.txt
Hello from my first text file.
sgoren@ubuntu:~/lab1$ ls -al
total 12
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 15:54 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 15:55 hello.txt
sgoren@ubuntu:~/lab1$
```

10- Do “cat hello.txt”. Do “man cat”

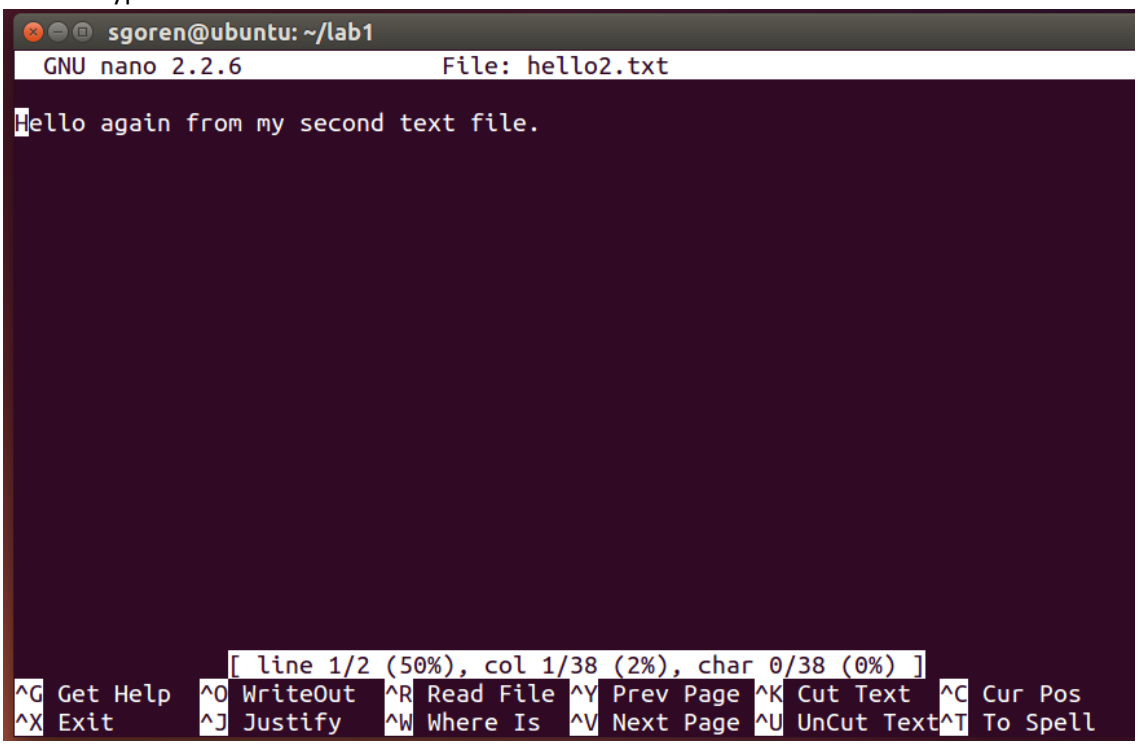
11- To find out how many words and characters there are in hello.txt, do “wc hello.txt”. Also do “man wc” and “wc --help”

12- Tell me the command that just prints the byte count.

13- Make a copy of hello.txt and name it hello2.txt




14- Edit hello2.txt by changing the text to “Hello again from my second text file.” You need a text editor to edit the file. You can use “nano” editor for now. Type “nano hello2.txt”. Edit the file, then type “Ctrl-O” to write to the file and “Ctrl X” to exit from the editor.



```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:~/lab1$ ls
hello.txt
sgoren@ubuntu:~/lab1$ cp hello.txt hello2.txt
sgoren@ubuntu:~/lab1$ ls -al
total 16
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 16:09 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:09 hello2.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 15:55 hello.txt
sgoren@ubuntu:~/lab1$ more hello2.txt
Hello from my first text file.
sgoren@ubuntu:~/lab1$ nano hello2.txt
sgoren@ubuntu:~/lab1$ cat hello2.txt
Hello again from my second text file.
sgoren@ubuntu:~/lab1$
```

15- Go one directory up by "cd ..", do "pwd". Then do "cd ./lab1", then do "pwd".

```
sgoren@ubuntu: ~/lab1
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:09 hello2.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 15:55 hello.txt
sgoren@ubuntu:~/lab1$ more hello2.txt
Hello from my first text file.
sgoren@ubuntu:~/lab1$ nano hello2.txt
sgoren@ubuntu:~/lab1$ cat hello2.txt
Hello again from my second text file.
sgoren@ubuntu:~/lab1$ nano hello2.txt
sgoren@ubuntu:~/lab1$ ls
hello2.txt  hello.txt
sgoren@ubuntu:~/lab1$ cd ..
sgoren@ubuntu:~$ pwd
/home/sgoren
sgoren@ubuntu:~$ ls
BEAGLEBONE     Documents       examples.desktop  Public          Templates
CPU            Downloads       FaultEmuProject   ROCOCO          tmp
CSE101-Python  encrpyt_old     lab1              ROCOCO.tar.gz   Videos
cse222         encrypt         Music             ROCOCO.zip.old
Desktop        EncryptProject  Pictures          sil
sgoren@ubuntu:~$ cd lab1/
sgoren@ubuntu:~/lab1$ pwd
/home/sgoren/lab1
sgoren@ubuntu:~/lab1$
```

16- Remove "hello2.txt" by "rm hello2.txt". To check whether the file is deleted, do "ls" again.

```
sgoren@ubuntu:~/lab1$ ls
hello2.txt  hello.txt
sgoren@ubuntu:~/lab1$ rm hello2.txt
sgoren@ubuntu:~/lab1$ ls
hello.txt
sgoren@ubuntu:~/lab1$
```

17- Make 5 copies of hello.txt, name them hello1.txt, hello2.txt, hello3.txt, hello4.txt, hello5.txt. Use arrows to repeat the command for not retyping.

```
sgoren@ubuntu:~/lab1$ ls
hello.txt
sgoren@ubuntu:~/lab1$ cp hello.txt hello1.txt
sgoren@ubuntu:~/lab1$ cp hello.txt hello2.txt
sgoren@ubuntu:~/lab1$ cp hello.txt hello3.txt
sgoren@ubuntu:~/lab1$ cp hello.txt hello4.txt
sgoren@ubuntu:~/lab1$ cp hello.txt hello5.txt
```

18- Search for “Hello” and then for “text” in all the files in the current directory. Note “*” denotes all. Don’t forget to read the manual page of “grep”.

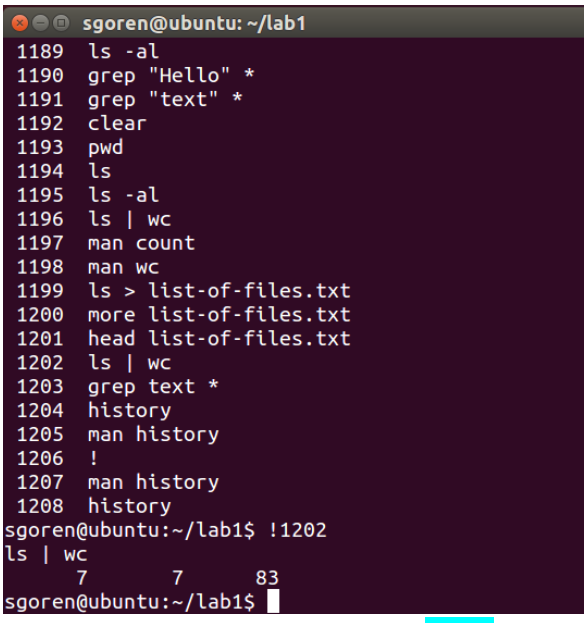
```
sgoren@ubuntu: ~/lab1
total 32
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 16:27 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello1.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello2.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello3.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello4.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello5.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 15:55 hello.txt
sgoren@ubuntu:~/lab1$ grep "Hello" *
hello1.txt:Hello from my first text file.
hello2.txt:Hello from my first text file.
hello3.txt:Hello from my first text file.
hello4.txt:Hello from my first text file.
hello5.txt:Hello from my first text file.
hello.txt:Hello from my first text file.
sgoren@ubuntu:~/lab1$ grep "text" *
hello1.txt:Hello from my first text file.
hello2.txt:Hello from my first text file.
hello3.txt:Hello from my first text file.
hello4.txt:Hello from my first text file.
hello5.txt:Hello from my first text file.
hello.txt:Hello from my first text file.
sgoren@ubuntu:~/lab1$ man grep
```

19- How many files do you have in your current directory? Use “ls | wc”. “|” denotes pipe which forwards the output of “ls” command to “wc” command.

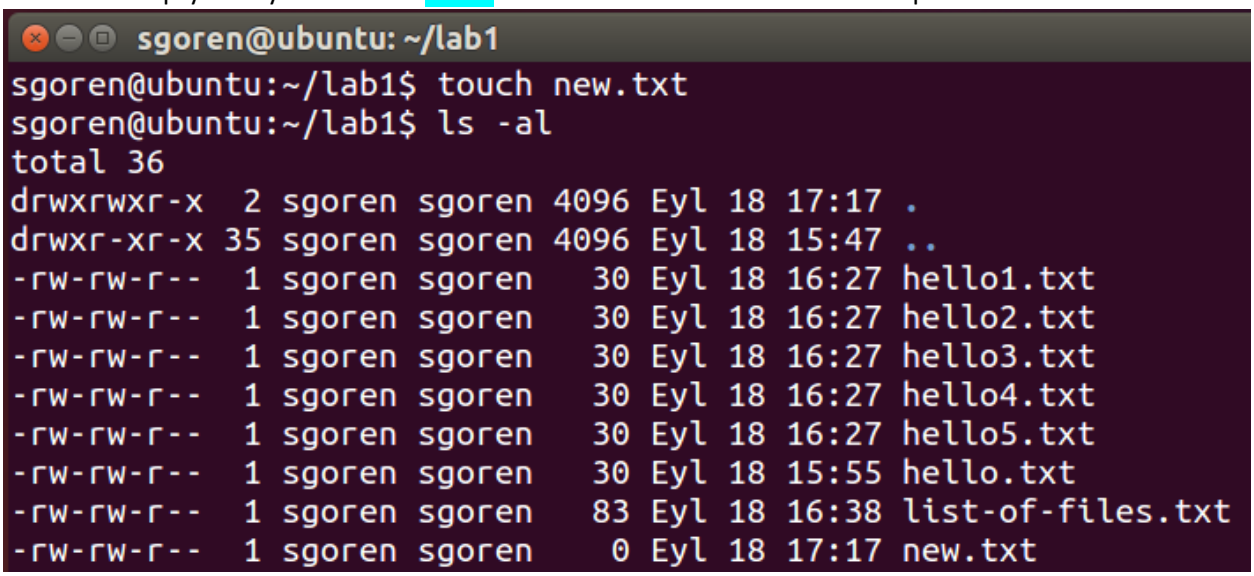
20- Create a list of files in the current directory  by “ls > list-of-files.txt”. “>” denotes redirect the output.

```
sgoren@ubuntu:~/lab1$ ls > list-of-files.txt
sgoren@ubuntu:~/lab1$ more list-of-files.txt
hello1.txt
hello2.txt
hello3.txt
hello4.txt
hello5.txt
hello.txt
list-of-files.txt
```

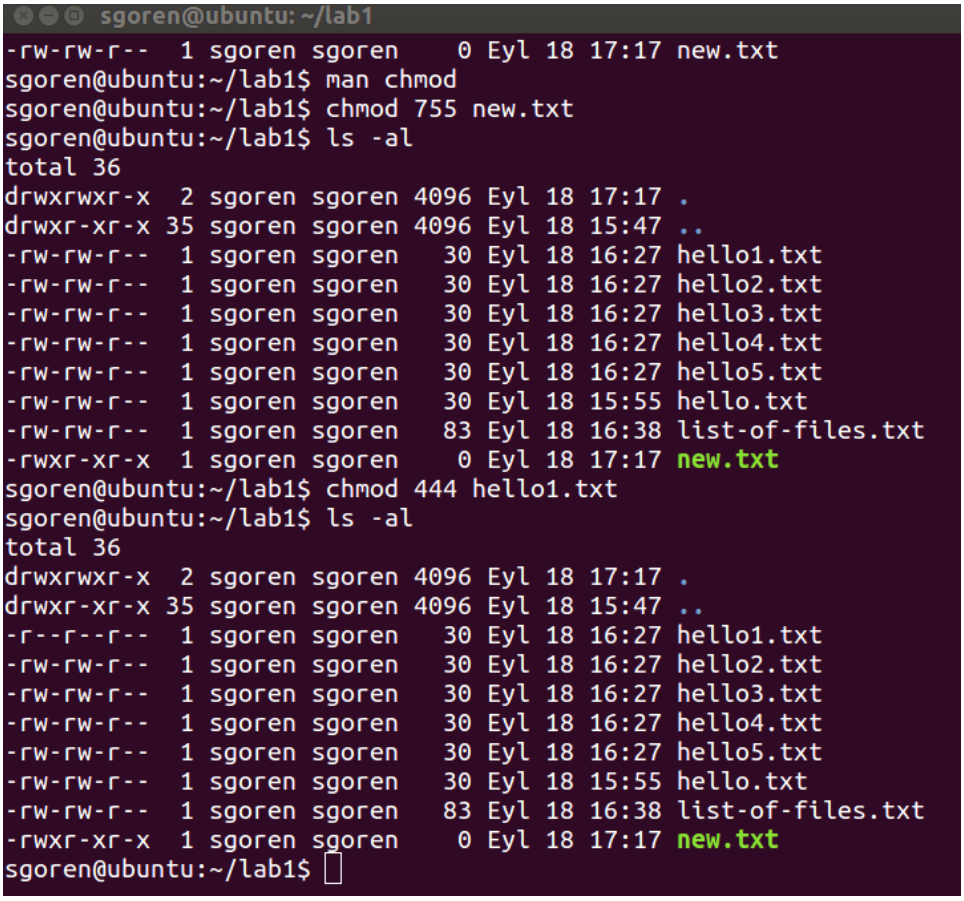
21- Type “man history”. Then type “history”. Repeat the command by “!n” n denotes the command number.




22- Create an empty file by command “touch new.txt”. Do “ls -al” to see the file permissions.




23- Make hello1.txt read-only, make new.txt executable. Use “chmod” command to change the permissions. Try to write to hello1.txt by opening it and editing it.




24- Type “clear” to clear the screen.

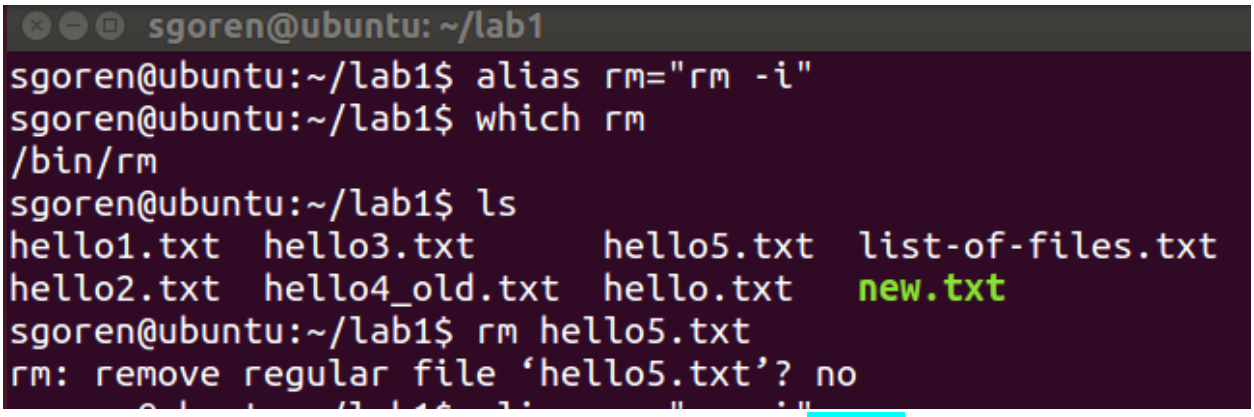
25- Change your directory to root “/” and do an “ls” and “pwd”. Go back to lab1 directory by typing “cd –“. Do “pwd” to check whether you are in lab1. Then create a new directory “mkdir newdir”. Then remove the directory by “rmdir newdir” (same as “rm -d newdir”)

```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:/$ ls
bin   dev   initrd.img  lost+found  opt   run   sys  var
boot  etc   lib         media       proc  sbin  tmp  vmlinuz
cdrom home  lib64       mnt         root  srv   usr
sgoren@ubuntu:/$ cd -
/home/sgoren/lab1
sgoren@ubuntu:~/lab1$ pwd
/home/sgoren/lab1
sgoren@ubuntu:~/lab1$ cd /
sgoren@ubuntu:/$ cd /home/sgoren/lab1/
sgoren@ubuntu:~/lab1$ mkdir tmpdir
sgoren@ubuntu:~/lab1$ ls
hello1.txt  hello3.txt  hello5.txt  list-of-files.txt  tmpdir
hello2.txt  hello4.txt  hello.txt   new.txt
sgoren@ubuntu:~/lab1$ ls -al
total 40
drwxrwxr-x  3 sgoren sgoren 4096 Eyl 18 17:35 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
-r--r--r--  1 sgoren sgoren   30 Eyl 18 16:27 hello1.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello2.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello3.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello4.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello5.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 15:55 hello.txt
-rw-rw-r--  1 sgoren sgoren   83 Eyl 18 16:38 list-of-files.txt
-rwxr-xr-x  1 sgoren sgoren    0 Eyl 18 17:17 new.txt
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 17:35 tmpdir
sgoren@ubuntu:~/lab1$ rmdir tmpdir/
sgoren@ubuntu:~/lab1$
```

26- Rename hello4.txt as hello4_old.txt by "mv hello4.txt hello4_old.txt"

```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:~/lab1$ ls
hello1.txt  hello3.txt  hello5.txt  list-of-files.txt
hello2.txt  hello4.txt  hello.txt   new.txt
sgoren@ubuntu:~/lab1$ mv hello4.txt hello4_old.txt
sgoren@ubuntu:~/lab1$ ls -al
total 36
drwxrwxr-x  2 sgoren sgoren 4096 Eyl 18 17:41 .
drwxr-xr-x 35 sgoren sgoren 4096 Eyl 18 15:47 ..
-r--r--r--  1 sgoren sgoren   30 Eyl 18 16:27 hello1.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello2.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello3.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello4_old.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 16:27 hello5.txt
-rw-rw-r--  1 sgoren sgoren   30 Eyl 18 15:55 hello.txt
-rw-rw-r--  1 sgoren sgoren   83 Eyl 18 16:38 list-of-files.txt
-rwxr-xr-x  1 sgoren sgoren    0 Eyl 18 17:17 new.txt
```

27- Use alias to make remove interactive by typing "alias rm="rm -i". When you try to remove a file it will ask your permission. Also "which rm" tells us where the "rm" command executable resides.




28- Often you may not know the available commands or libraries. Use "apropos" to find out. For example, suppose we are looking for a browser. Then we type "apropos browser". You can see a browser called firefox is available.

```
sgoren@ubuntu:~/lab1$ apropos browser
charmap (1)          - Unicode character picker and font browser
firefox (1)          - a free and open source web browser from Mozilla
git-web--browse (1)  - Git helper script to launch a web browser
gnome-character-map (1) - Unicode character picker and font browser
gucharmap (1)        - Unicode character picker and font browser
infobrowser (1)      - read Info documents
libsmbclient (7)     - An extension library for browsers and that can be...
sensible-browser (1) - sensible editing, paging, and web browsing
smbtree (1)          - A text based smb network browser
viewres (1)          - graphical class browser for Xt
```

29- Find out available editors by typing "apropos editor". Type "ps" to list the current running processes. Then invoke gedit, xedit, emacs by running in the background by appending a "&". So that you can use the terminal. Then type "ps" again.

```
sgoren@ubuntu:~/lab1$ ps
   PID TTY          TIME CMD
  8782 pts/0    00:00:00 bash
  9538 pts/0    00:00:00 ps
sgoren@ubuntu:~/lab1$ gedit & emacs & xedit &
[1] 9539
[2] 9540
[3] 9541
```

```
sgoren@ubuntu:~/lab1$ ps
   PID TTY          TIME CMD
  8782 pts/0    00:00:00 bash
  9539 pts/0    00:00:00 gedit
  9540 pts/0    00:00:00 emacs
  9541 pts/0    00:00:00 xedit
  9559 pts/0    00:00:00 ps
```

30- You can kill these processes either by bringing them foreground by typing "fg" and then do a "Ctrl-C", or you can just type "kill -9 pid" note that pid denotes process id.

```
sgoren@ubuntu:~/lab1$ ps
   PID TTY          TIME CMD
  8782 pts/0    00:00:00 bash
  9539 pts/0    00:00:00 gedit
  9540 pts/0    00:00:00 emacs
  9541 pts/0    00:00:00 xedit
  9559 pts/0    00:00:00 ps
sgoren@ubuntu:~/lab1$ fg
xedit
^C
sgoren@ubuntu:~/lab1$ ps
   PID TTY          TIME CMD
  8782 pts/0    00:00:00 bash
  9539 pts/0    00:00:00 gedit
  9540 pts/0    00:00:01 emacs
  9577 pts/0    00:00:00 ps
sgoren@ubuntu:~/lab1$ kill -9 9539 9540
sgoren@ubuntu:~/lab1$ ps
   PID TTY          TIME CMD
  8782 pts/0    00:00:00 bash
  9578 pts/0    00:00:00 ps
[1]-  Killed                  gedit
[2]+  Killed                  emacs
sgoren@ubuntu:~/lab1$
```

31- Invoke "emacs" in the foreground. But you need to use the terminal, then suspend first process by typing "Ctrl-Z", then type "bg" to make emacs run in the background.

```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:~/lab1$ emacs
^Z
[1]+  Stopped                 emacs
sgoren@ubuntu:~/lab1$ bg
[1]+ emacs &
sgoren@ubuntu:~/lab1$ ps
   PID TTY          TIME CMD
  8782 pts/0    00:00:00 bash
  9584 pts/0    00:00:00 emacs
  9587 pts/0    00:00:00 ps
sgoren@ubuntu:~/lab1$
```

32- Redirect from a file and to a file.

```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:~/lab1$ wc < hello.txt
 0  6 30
sgoren@ubuntu:~/lab1$ wc < hello.txt > wcout
sgoren@ubuntu:~/lab1$ ls -l
total 32
-r--r--r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello1.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello2.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello3.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello4_old.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello5_old.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 15:55 hello.txt
-rw-rw-r-- 1 sgoren sgoren 83 Eyl 18 16:38 list-of-files.txt
-rwxr-xr-x 1 sgoren sgoren  0 Eyl 18 17:17 new.txt
-rw-rw-r-- 1 sgoren sgoren  9 Eyl 18 18:29 wcout
sgoren@ubuntu:~/lab1$ more wcout
 0  6 30
sgoren@ubuntu:~/lab1$
```

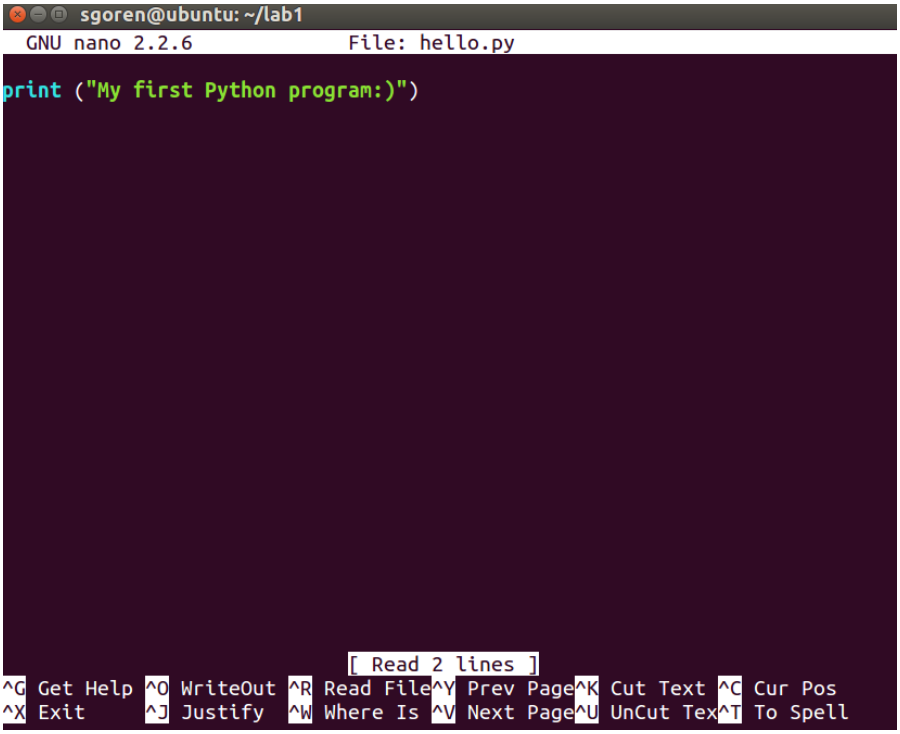
33- Append a file.

```
sgoren@ubuntu:~/lab1$ more wcout
 0  6 30
sgoren@ubuntu:~/lab1$ cat hello.txt >> wcout
sgoren@ubuntu:~/lab1$ more wcout
 0  6 30
Hello from my first text file.
sgoren@ubuntu:~/lab1$
```

34- Redirect to STDERR (standard error)

```
sgoren@ubuntu:~/lab1$ ls
hello1.txt  hello3.txt      hello5_old.txt  list-of-files.txt  wcout
hello2.txt  hello4_old.txt  hello.txt       new.txt
sgoren@ubuntu:~/lab1$ ls
hello1.txt  hello3.txt      hello5_old.txt  list-of-files.txt  wcout
hello2.txt  hello4_old.txt  hello.txt       new.txt
sgoren@ubuntu:~/lab1$ cat hello7.txt
cat: hello7.txt: No such file or directory
sgoren@ubuntu:~/lab1$ cat hello7.txt 2> errors.txt
sgoren@ubuntu:~/lab1$ more errors.txt
cat: hello7.txt: No such file or directory
sgoren@ubuntu:~/lab1$
```

35- The first Python program. Invoke editor nano. Type as the following and save it as “hello.py”




36- Run hello.py by calling “python hello.py”

```
sgoren@ubuntu: ~/lab1
sgoren@ubuntu:~/lab1$ ls -l
total 40
-rw-rw-r-- 1 sgoren sgoren 43 Eyl 18 18:43 errors.txt
-r--r--r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello1.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello2.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello3.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello4_old.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello5_old.txt
-rw-rw-r-- 1 sgoren sgoren 37 Eyl 18 18:51 hello.py
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 15:55 hello.txt
-rw-rw-r-- 1 sgoren sgoren 83 Eyl 18 16:38 list-of-files.txt
-rwxr-xr-x 1 sgoren sgoren  0 Eyl 18 17:17 new.txt
-rw-rw-r-- 1 sgoren sgoren 39 Eyl 18 18:35 wcout
sgoren@ubuntu:~/lab1$ which python
/usr/bin/python
sgoren@ubuntu:~/lab1$ python hello.py
My first Python program:)
sgoren@ubuntu:~/lab1$
```

37- In order to make an executable of your program, invoke nano and edit the program as the following and save & exit.

```
sgoren@ubuntu: ~/lab1
  GNU nano 2.2.6              File: hello.py

#!/usr/bin/python3

print ("My first Python program:)")

                        [ Wrote 4 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Tex ^T To Spell
```

38- Then give execute permission to hello.py and run it as the following.

```
sgoren@ubuntu:~/lab1$ chmod 755 hello.py
sgoren@ubuntu:~/lab1$ ls -l
total 40
-rw-rw-r-- 1 sgoren sgoren 43 Eyl 18 18:43 errors.txt
-r--r--r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello1.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello2.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello3.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello4_old.txt
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 16:27 hello5_old.txt
-rwxr-xr-x 1 sgoren sgoren 57 Eyl 18 19:00 hello.py
-rw-rw-r-- 1 sgoren sgoren 30 Eyl 18 15:55 hello.txt
-rw-rw-r-- 1 sgoren sgoren 83 Eyl 18 16:38 list-of-files.txt
-rwxr-xr-x 1 sgoren sgoren  0 Eyl 18 17:17 new.txt
-rw-rw-r-- 1 sgoren sgoren 39 Eyl 18 18:35 wcout
sgoren@ubuntu:~/lab1$ ./hello.py
My first Python program:)
sgoren@ubuntu:~/lab1$
```

For more useful links

http://www.ee.surrey.ac.uk/Teaching/Unix/

http://ryanstutorials.net/linuxtutorial/

http://code.org