

## Laboratory Experiment II

# THE LINUX DIRECTORY STRUCTURE

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# INTRODUCTION

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This experiment involves working in the Linux shell and the concept of directory tree structuring. It includes navigating through the file structure and working with files and directories.

Four parts make up this experiment:

Part I—deals with creating files and directories, changing directories, and displaying directory contents.

Part II—works on various directory listing options and the comparison between the list command options.

Part III—helps you understand the contents of the root directory.

Part IV—determines the best way to remove a directory.

# LABORATORY SHEETS

## LABORATORY EXPERIMENT II

LEHMAN COLLEGE  
Of the City University of New York

Experiment 2: The Directory Structure

Objective: To study the concept of directory tree structuring

Procedure: Part I.

1. Login to your working directory.
2. Make a subdirectory under your working directory.
  - Use your name as the subdirectory name with a "01" at the end of your name.  
I.e. "your name"01.
  - Use the mkdir command to create the directory. i.e. mkdir john01
3. Make another subdirectory under your home directory and use 02 at the end of your name
4. Change directory to the "your name"01 directory.
5. Create a file in the "your name"01 directory.
6. Return to your home directory.
 

How did you return to your home directory?

NOTE: You were just given instruction to perform functions. You find the commands needed to perform the functions.
7. Enter the command ls -l.
 

How do you tell a directory from an ordinary file?
8. Enter the command ls.
 

How do you tell a directory from an ordinary file?

**Sheet 1-1** Experiment procedures (Part I).

Part II.

1. Type the command ls -l.
2. Type the command ls -al.
 

What do you notice between the two commands? Did you notice any new files or directories?
3. Type the commands ls -F.
 

What do you notice about the command?
4. Copy the file from "your name"01 to the directory "your name"02.
5. Change directory to "your name"02.
6. Copy the file from your home directory to the present directory.
 

How did you perform this task? How did you perform the task in step 4?

Explain, in detail, as to whether you used relative or absolute path movement. Explain the difference between the two.

**Sheet 1-2** Experiment procedures (Part II).

Part III.

1. Change directory to the root directory. i.e. cd /.
2. Type the command ls -al.
3. Explain and discuss the files and directories you find.

**Sheet 1-3** Experiment procedures (Part III).

Part IV.

1. Return to your home directory
2. Type the command rm "your name"02. What happened?
3. Type the command rm -r "your name"02. What happened?
4. Explain, in detail, the difference between rm and rm -r commands.

**Sheet 1-4** Experiment procedures (Part IV).

## Procedures

The procedures on this page represent the tasks to complete, in four parts. Some tasks require simple explanations, while others need a more detailed analysis.

In the next section, each sheet is revisited for clarity.

# 2

## DATA SHEETS

### LABORATORY EXPERIMENT II

#### Procedures—Part I.

1. Login to your working directory.
2. Make a subdirectory under your working directory.
  - Use your name as the subdirectory name with a "01" at the end of your name. I.e. "your name"01.
  - Use the mkdir command to create the directory. i.e. mkdir john01
3. Make another subdirectory under your home directory and use 02 at the end of your name
4. Change directory to the "your name"01 directory.
5. Create a file in the "your name"01 directory.
6. Return to your home directory.

How did you return to your home directory?

NOTE: You were just given instruction to perform functions. You find the commands needed to perform the functions.

7. Enter the command ls -l.

How do you tell a directory from an ordinary file?

8. Enter the command ls.

How do you tell a directory from an ordinary file?

Sheet 2-1 Experiment procedures (Part I).

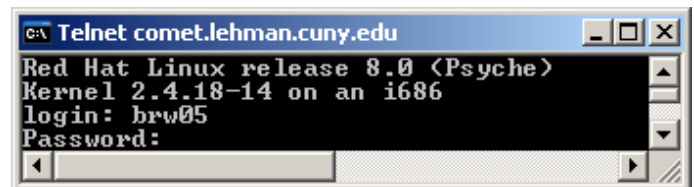
## Results

This section contains results to the procedures presented on the laboratory sheets in the previous section. The Analysis section provides in-depth explanations to various questions.

### Part I

Below are results for Part I (Sheet 2-1) of the experiment.

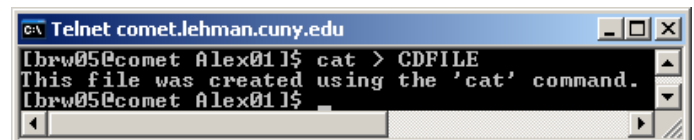
1. I logged into my working directory using my current username and password shown in **Output 2-1**.



```
G:\ Telnet comet.lehman.cuny.edu
Red Hat Linux release 8.0 (Psyche)
Kernel 2.4.18-14 on an i686
login: brw05
Password:
```

Output 2-1 Login screen (including password prompt).

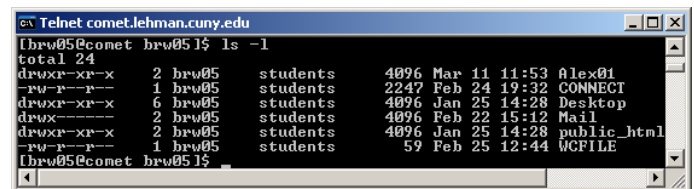
2. **mkdir Alex01**
3. **mkdir Alex02**
4. **cd Alex01**
5. I utilized the **cat** command to create a file (**Output 2-2**).



```
G:\ Telnet comet.lehman.cuny.edu
[brw05@comet Alex01]$ cat > CDFILE
This file was created using the 'cat' command.
[brw05@comet Alex01]$
```

Output 2-2 Utilizing cat to create a file.

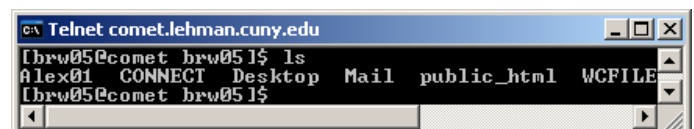
6. **cd \$HOME**
7. **Output 2-3** displays results of the **ls -l** command.



```
G:\ Telnet comet.lehman.cuny.edu
[brw05@comet brw05]$ ls -l
total 24
drwxr-xr-x 2 brw05 students 4096 Mar 11 11:53 Alex01
-rw-r--r-- 1 brw05 students 2247 Feb 24 19:32 CONNECT
drwxr-xr-x 6 brw05 students 4096 Jan 25 14:28 Desktop
drwx----- 2 brw05 students 4096 Feb 22 15:12 Mail
drwxr-xr-x 2 brw05 students 4096 Jan 25 14:28 public_html
-rw-r--r-- 1 brw05 students 59 Feb 25 12:44 WCFILE
[brw05@comet brw05]$
```

Output 2-3 Results of the ls -l command (issued in home directory).

8. The **ls** command displays results shown in **Output 2-4**.



```
G:\ Telnet comet.lehman.cuny.edu
[brw05@comet brw05]$ ls
Alex01 CONNECT Desktop Mail public_html WCFILE
[brw05@comet brw05]$
```

Output 2-4 Results of the ls command (issued in my home directory).

**Procedures—Part II.**

1. Type the command `ls -l`.
2. Type the command `ls -al`.

What do you notice between the two commands? Did you notice any new files or directories?

3. Type the commands `ls -F`.

What do you notice about the command?

4. Copy the file from “your name”01 to the directory “your name”02.
5. Change directory to “your name”02.
6. Copy the file from your home directory to the present directory.

How did you perform this task? How did you perform the task in step 4? Explain, in detail, as to whether you used relative or absolute path movement. Explain the difference between the two.

**Sheet 2-2** Experiment procedures (Part II).

**Part II**

Below are results for Part II (Sheet 2-2) of the experiment.

1. The `ls -l` command displays results shown in **Output 2-3** on the previous page.
2. The `ls -al` command displays results shown in **Output 2-5**.

```

Telnet comet.lehman.cuny.edu
[brw05@comet brw05]$ ls -al
total 228
drwxr-xr-x 19 brw05 students 4096 Mar 11 11:23 .
drwxr-xr-x 22 root root 4096 Mar 2 08:49 ..
drwxr-xr-x 1 brw05 students 147 Feb 22 09:59 .aspell.english.prepl
-rw-r--r-- 1 brw05 students 26 Feb 22 09:59 .aspell.english.pws
-rw-r--r-- 1 brw05 students 4771 Mar 10 19:39 .bash_history
-rw-r--r-- 1 brw05 students 24 Jan 25 14:28 .bash_logout
-rw-r--r-- 1 brw05 students 303 Jan 25 14:28 .bash_profile
-rw-r--r-- 1 brw05 students 124 Jan 25 14:28 .bashrc
-rw-r--r-- 1 brw05 students 551 Jan 25 14:28 .canna
-rw-r--r-- 1 brw05 students 2247 Feb 24 19:32 .CONNECT
drwxr-xr-x 6 brw05 students 4096 Jan 25 14:28 .Desktop
-rw-r--r-- 1 brw05 students 854 Jan 25 14:28 .enacs
-rw-r--r-- 1 brw05 students 16 Feb 1 19:36 .esd_auth
drwxr-xr-x 1 brw05 students 38800 Feb 1 19:08 .font-cache-1
drwxr-xr-x 5 brw05 students 4096 Mar 3 18:51 .gconf
drwxr-xr-x 3 brw05 students 4096 Mar 3 19:33 .gconfd
drwxr-xr-x 6 brw05 students 4096 Mar 3 18:55 .gnome
drwxr-xr-x 5 brw05 students 4096 Mar 3 19:33 .gnome2
drwxr-xr-x 2 brw05 students 4096 Feb 1 19:08 .gnome2_private
drwxr-xr-x 2 brw05 students 4096 Feb 1 19:08 .gnome-desktop
-rw-r--r-- 1 brw05 students 120 Jan 25 14:28 .gtkrc
-rw-r--r-- 1 brw05 students 145 Feb 1 19:08 .gtkrc-1.2-gnome2
-rw-r--r-- 1 brw05 students 0 Mar 3 19:33 .ICEauthority
drwxr-xr-x 4 brw05 students 4096 Jan 25 14:28 .kderc
-rw-r--r-- 1 brw05 students 435 Jan 25 14:28 .kderc
drwxr-xr-x 2 brw05 students 4096 Feb 22 15:12 .Mail
-rw-r--r-- 1 brw05 students 1695 Mar 3 18:54 .mailcap
drwxr-xr-x 3 brw05 students 4096 Feb 1 19:08 .netactivity
-rw-r--r-- 1 brw05 students 11 Feb 22 15:12 .nh_profile
-rw-r--r-- 1 brw05 students 635 Mar 3 18:54 .nine.types
drwxr-xr-x 3 brw05 students 4096 Feb 3 18:49 .mozilla
drwxr-xr-x 3 brw05 students 4096 Feb 1 19:08 .nautilus
drwxr-xr-x 3 brw05 students 4096 Mar 3 18:54 .netscape
drwxr-xr-x 3 brw05 students 4096 Mar 3 18:54 .netscape6
drwxr-xr-x 3 brw05 students 4096 Mar 3 18:55 .openoffice
drwxr-xr-x 2 brw05 students 4096 Jan 25 14:28 .public_html
-rw-r--r-- 1 brw05 students 497 Feb 1 19:08 .rhn-applet.conf
-rw-r--r-- 1 brw05 students 3324 Jan 25 14:28 .screenrc
-rw-r--r-- 1 brw05 students 76 Mar 3 18:55 .sversionrc
-rw-r--r-- 1 brw05 students 12288 Feb 8 18:53 .svp
-rw-r--r-- 1 brw05 students 2048 Mar 3 18:59 .user60.rdb
-rw-r--r-- 1 brw05 students 3653 Feb 25 12:56 .vininfo
-rw-r--r-- 1 brw05 students 0 Feb 8 19:21 .vininfo.tnp
-rw-r--r-- 1 brw05 students 0 Feb 19 00:20 .vininfo2.tnp
-rw-r--r-- 1 brw05 students 59 Feb 25 12:44 .WCFILE
-rw-r--r-- 1 brw05 students 0 Mar 3 19:33 .xauthority
-rw-r--r-- 1 brw05 students 399 Mar 3 18:55 .xsession-errors
[brw05@comet brw05]$

```

**Output 2-5** Results of the `ls -al` command.

3. The `ls -F` command displays results shown in **Output 2-6**.

```

Telnet comet.lehman.cuny.edu
[brw05@comet brw05]$ ls -F
Alex01/ .CONNECT .Desktop/ .Mail/ .public_html/ .WCFILE
[brw05@comet brw05]$

```

**Output 2-6** Results of the `ls -F` command.

4. `cp Alex01/CDFILE Alex02`
5. `cd Alex02`
6. `cp ~/CONNECT CONNECT`

**Procedures—Part III.**

1. Change directory to the root directory. i.e. `cd /`.
2. Type the command `ls -al`.
3. Explain and discuss the files and directories you find.

**Sheet 2-3** Experiment procedures (Part III).

**Procedures—Part IV.**

1. Return to your home directory
2. Type the command `rm "your name"02`. What happened?
3. Type the command `rm -r "your name"02`. What happened?
4. Explain, in detail, the difference between `rm` and `rm -r` commands.

**Sheet 2-4** Experiment procedures (Part IV).

**Part III**

Below are results for Part III (**Sheet 2-3**) of the experiment.

1. `cd /`.
2. The `ls -al` command displays results shown in **Output 2-7**.

```

Telnet comet.lehman.cuny.edu
brw05@comet ~$ ls -al
total 332
drwxr-xr-x  22 root  root    4096 Dec 19 08:13 .
drwxr-xr-x  22 root  root    4096 Dec 19 08:13 ..
-rw-r--r--   1 root  root      0 Dec 19 07:39 .autofsck
drwxr-xr-x   2 root  root    4096 Aug 27 2002 .automount
-rw-r--r--   1 root  root    203 May 17 2004 .bash_history
-rw-r--r--   2 root  root    4096 Jun 11 2003 bin
drwxr-xr-x   3 root  root    4096 Jun 11 2003 boot
drwxr-xr-x  20 root  root   118784 Dec 19 08:13 dev
drwxr-xr-x  86 root  root    8192 Mar  7 09:35 etc
-rw-r--r--   1 root  root   102987 Jun 11 2003 .fonts.cache-1
drwxr-xr-x   9 root  root    4096 Jan 10 12:27 home
drwxr-xr-x   2 root  root    4096 Jun 21 2001 initrd
drwxr-xr-x  10 root  root    4096 Jun 24 2003 lib
drwx-----  2 root  root   16384 Jun 11 2003 lost+found
drwxr-xr-x   2 root  root    4096 Aug 27 2002 misc
drwxr-xr-x   4 root  root    4096 Jun 11 2003 mnt
drwxr-xr-x   2 root  root    4096 Aug 23 1999 opt
drwxr-xr-x   2 root  root    4096 Jun 24 2003 pgsql
dr-xr-xr-x 125 root  root      0 Dec 19 07:38 proc
drwxr-xr-x  26 root  root    4096 Mar  7 09:37 root
drwxr-xr-x   2 root  root    8192 Jan 11 10:00/sbin
drwxr-xr-x   3 root  root    4096 Jun 11 2003 tftphoot
drwxr-xr-x  14 root  root    4096 Mar 11 13:39 tmp
drwxr-xr-x  20 root  root    4096 Aug 26 2003 usr
drwxr-xr-x  33 root  root    4096 Jun 23 2003 var
brw05@comet ~$

```

**Output 2-7** Results of the `ls -al` command.

3. Most of the files and directories contained in the root directory (**Output 2-7**) are standard to the Linux operating system (See **Diagram 3-1** on page 4).

**Part IV**

Below are results for Part IV (**Sheet 2-4**) of the experiment.

1. `cd ~`.
2. The `rm Alex02` command displays results shown in **Output 2-8**.

```

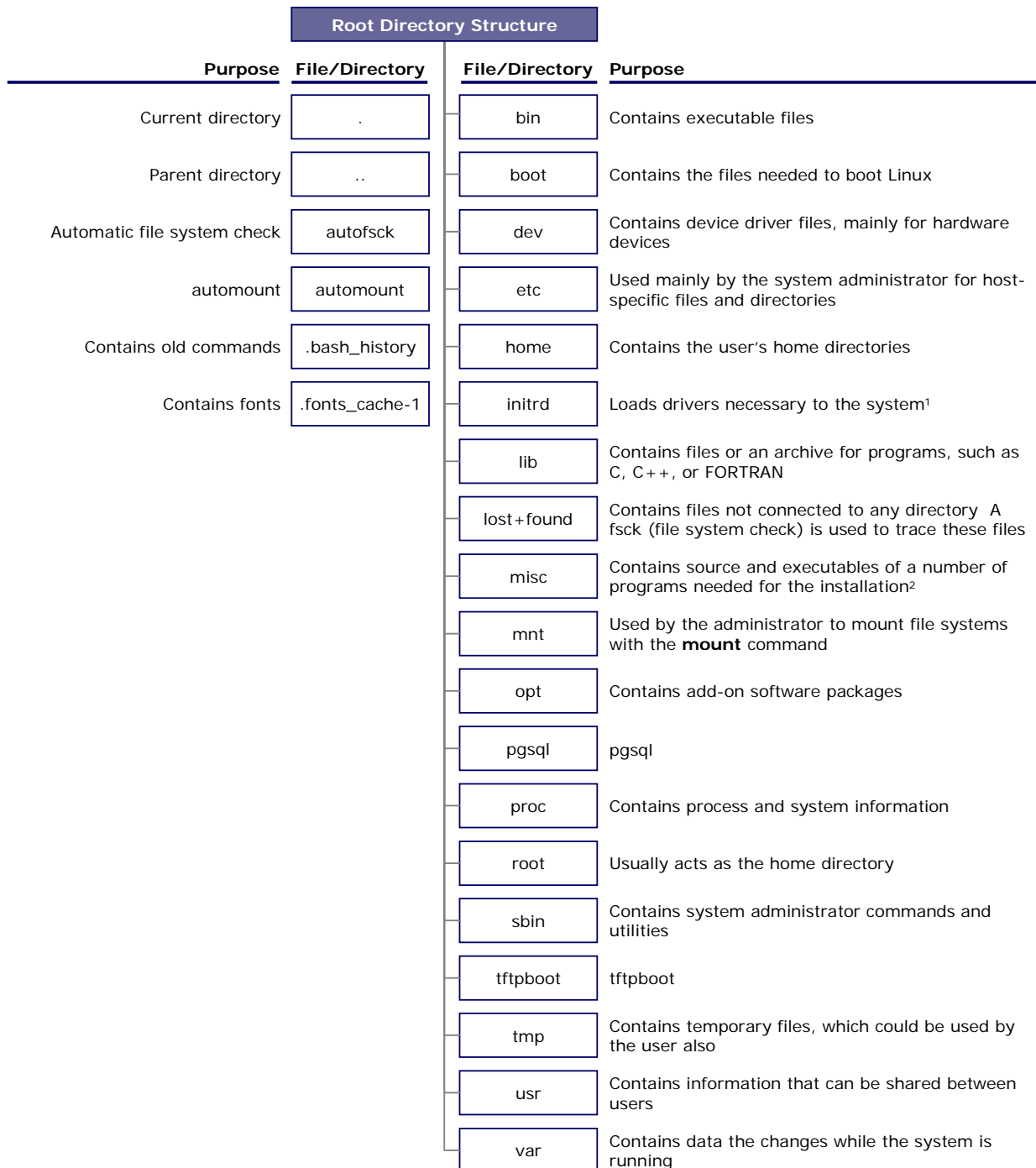
Command Prompt
[brw05@comet brw05]$ rm Alex02
rm: cannot remove 'Alex02': Is a directory
[brw05@comet brw05]$

```

**Output 2-8** Results of the `rm Alex` command.

3. The `rm -r Alex02` command removes the `Alex02` directory.
4. See Analysis section.

### LABORATORY EXPERIMENT II



**Diagram 3-1** Root directory structure.

Notes:

1. [A Detailed Look at the Boot Process](http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/ref-guide/s1-boot-init-shutdown-process.html): <http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/ref-guide/s1-boot-init-shutdown-process.html>
2. [Linux.com—Anatomy of the Red Hat FTP site](http://www.linux.com/howtos/RedHat-CD-HOWTO/redhat-ftp-site.shtml): <http://www.linux.com/howtos/RedHat-CD-HOWTO/redhat-ftp-site.shtml>



### LABORATORY EXPERIMENT II

#### Procedures—Part I.

1. Login to your working directory.
2. Make a subdirectory under your working directory.
  - Use your name as the subdirectory name with a "01" at the end of your name. I.e. "your name"01.
  - Use the mkdir command to create the directory. i.e. mkdir john01
3. Make another subdirectory under your home directory and use 02 at the end of your name
4. Change directory to the "your name"01 directory.
5. Create a file in the "your name"01 directory.
6. Return to your home directory.

How did you return to your home directory?

NOTE: You were just given instruction to perform functions. You find the commands needed to perform the functions.

7. Enter the command ls -l.

How do you tell a directory from an ordinary file?

8. Enter the command ls.

How do you tell a directory from an ordinary file?

This section contains a more detailed discussion of the results presented in the Data Sheets' section. It also notes any discoveries or errors encountered during the experiment.

Some questions presented straightforward results; therefore, I only note questions that need explanations. The procedures (**Sheets 1–4**) listed to the left revisit the tasks for each part. It may assist you in locating the task mentioned in the explanations.

#### Sheet 4-1 Experiment procedures (Part I).

#### Procedures—Part II.

1. Type the command ls -l.
2. Type the command ls -al.

What do you notice between the two commands? Did you notice any new files or directories?

3. Type the commands ls -F.

What do you notice about the command?

4. Copy the file from "your name"01 to the directory "your name"02.
5. Change directory to "your name"02.
6. Copy the file from your home directory to the present directory.

How did you perform this task? How did you perform the task in step 4? Explain, in detail, as to whether you used relative or absolute path movement. Explain the difference between the two.

#### Sheet 4-2 Experiment procedures (Part II).

#### Procedures—Part III.

1. Change directory to the root directory. i.e. cd /.
2. Type the command ls -al.
3. Explain and discuss the files and directories you find.

#### Sheet 4-3 Experiment procedures (Part III).

#### Procedures—Part IV.

1. Return to your home directory
2. Type the command rm "your name"02. What happened?
3. Type the command rm -r "your name"02. What happened?
4. Explain, in detail, the difference between rm and rm -r commands.

#### Sheet 4-4 Experiment procedures (Part IV).

```

Telnet comet.lehman.cuny.edu
brw05@comet: brw05 I$ ls -l
total 24
drwxr-xr-x  2 brw05  students  4096 Mar 11 11:53 alex01
-rw-r--r--  1 brw05  students  2247 Feb 24 19:32 CONNECT
drwxr-xr-x  6 brw05  students  4096 Jan 25 14:28 Desktop
drwx----- 2 brw05  students  4096 Feb 22 15:12 Mail
drwxr-xr-x  2 brw05  students  4096 Jan 25 14:28 public_html
-rw-r--r--  1 brw05  students   59 Feb 25 12:44 WCFILE
brw05@comet: brw05 I$

```

**Output 4-1** Results of the `ls -l` command. It lists the directory contents in long format. The first column displays the file attributes.

## Explanations

### Part I

#### 1. Task 1:

Once I login, my system defaults to the home directory; therefore, my experiments start in the home directory.

#### 2. Task 5:

Although the `cat` command concatenates files or show contents of a file, it can also create files with the `>` symbol (243). To create the new file—`CDFILE`—I used the code below:

```
cat > CDFILE <Enter>
```

```
This file was created using the 'cat' command. <Enter>
<ctrl-d>
```

**Discovery:** The `touch` command (A-74), given by a hint from the professor, also creates a file. If a file does not exist, it can be created with the following syntax:

```
touch CDFILE <Enter>
```

#### 3. Task 6:

I used `cd $HOME` to return to the home directory. `cd ~` also returns to the home directory.

#### 4. Task 7:

`ls -l` lists directory contents in long format. To distinguish between files and directories, look at the first item in the attribute list. A directory usually displays a `'d'` and a file displays a `'-'` (**Output 4-1**).

#### 5. Task 8:

The `ls` command lists the directory contents. In this list, directories are usually a different color, such as blue. However, not all systems display color-coded directories.

**Discovery:** When I login from a Microsoft Windows system via Telnet, no color-coded distinction between files and directories appears with the `ls` command. Therefore, I would have to use `ls -l` or another option to distinguish between the two.

```

Telnet comet.lehman.cuny.edu
[brw05@comet brw05]$ ls -F
Alex01/ CONNECT Desktop/ Mail/ public_html/ WCFILE
[brw05@comet brw05]$

```

Output 4-2 Results of the `ls -F` command.

```

Command Prompt
[brw05@comet brw05]$ rm Alex02
rm: cannot remove 'Alex02': Is a directory
[brw05@comet brw05]$

```

Output 4-3 Results of the `rm Alex` command.

## Part II

1. **Task 2:**  
The `ls -al` command lists all contents in long format, including hidden files.
2. **Task 3:**  
**Output 4-2** revisits the `ls -F` command (174). It displays '/' after directories, '\*' after binary executables, and '@' after symbolic links.

**Discovery:** Text files contain no symbol.

3. **Task 6:**  
Absolute paths move directly from the root directory to the target directory without shortcuts or skipping any subdirectories. All absolute paths start with the '/' symbol.

Absolute path example:

```
cd /home/brw05/Alex02
```

Relative paths do not start with the '/' symbol.

Relative path example:

```
cd ../../Alex02
```

## Part III

1. **Task 3:**  
Please see **Diagram 3-1** on page 4.

## Part IV

1. **Task 2:**  
Because the `rm Alex02` command attempted to remove a directory, an error (**Output 4-3**) occurs.
2. **Task 3:**  
The `rm -r Alex02` command removed the `Alex02` directory.
3. **Task 4:**  
The `rm` command removes files. It will not remove a directory without any arguments.

The `rm -r` removes a directory and the files in it.

**Discovery:** `rmdir` also removes a directory. However, the directory has to be empty first. The `rmdir` and `rm -r` commands will 'not' work if you are in the current directory.

## References

1. Sarwar, Syed Mansoor, Robert Koretsky, Syed Aqeel Sarwar. Linux: The Textbook. Boston: Addison Wesley Longman Inc., 2002.