



**NATIONAL TEXTILE**  
**UNIVERSITY**

DEPARTMENT OF COMPUTER SCIENC

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**SECTION SE: 5th (A)**

**Operating Systems- LAB2 activity**

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**SUBMISSION DATE: 26/9/25**

# Operating Systems – COC 3071L

SE 5th A – Fall 2025

## Lab 2: Linux Basics and Introduction

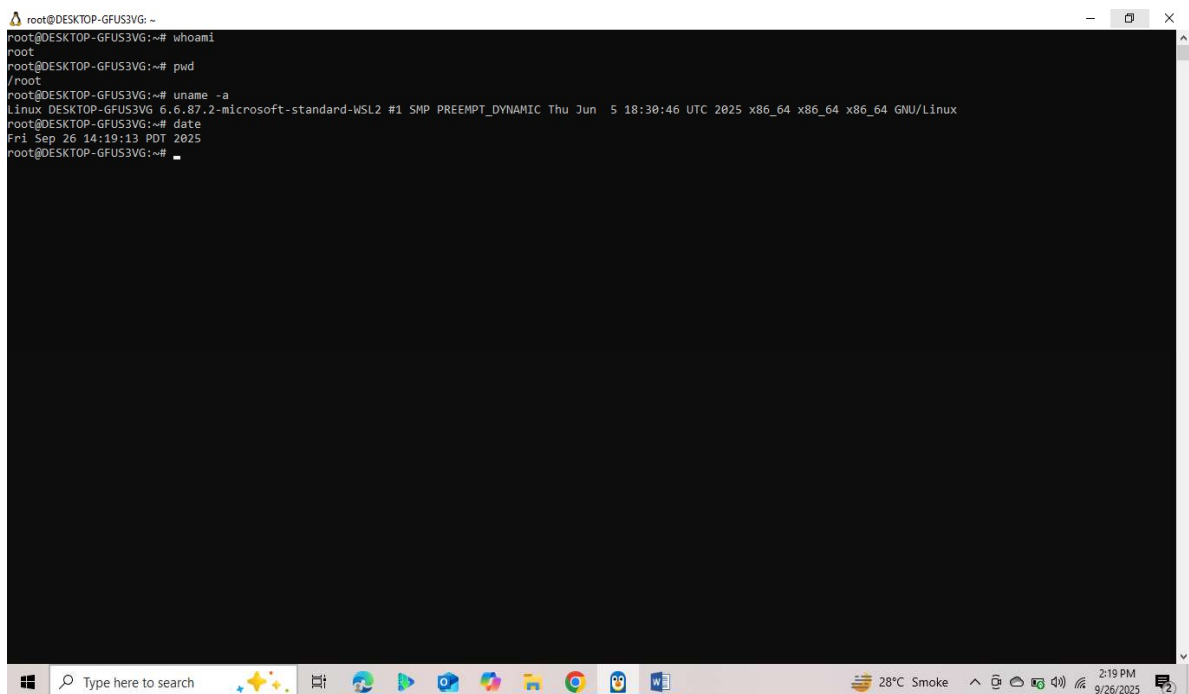
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### Part 1: Linux Environment Orientation

#### 1.1 Understanding the Linux Environment

- **Concepts to Cover:**
  - What is Linux? Brief history and distributions
  - Linux vs Windows: Key differences
  - Understanding the shell (bash)
  - WSL2 as a Linux environment
- **Hands-on Activity:**

```
# Students open WSL2 terminal and explore
whoami          # Check current user
pwd             # Print working directory
uname -a        # System information
date            # Current date and time
```



```
root@DESKTOP-GFUS3VG: ~
root@DESKTOP-GFUS3VG:~# whoami
root
root@DESKTOP-GFUS3VG:~# pwd
/root
root@DESKTOP-GFUS3VG:~# uname -a
Linux DESKTOP-GFUS3VG 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Thu Jun  5 18:30:46 UTC 2025 x86_64 x86_64 x86_64 GNU/Linux
root@DESKTOP-GFUS3VG:~# date
Fri Sep 26 14:19:13 PDT 2025
root@DESKTOP-GFUS3VG:~#
```

## 1.2 Getting Help in Linux

- Commands to demonstrate:

<code>man ls</code>	# Manual pages
<code>ls --help</code>	# Built-in help
<code>which ls</code>	# Location of commands
<code>type ls</code>	# Command type information

Man ls:

```
Select root@DESKTOP-GFUS3VG: ~
ls(1)
NAME
  ls - list directory contents
SYNOPSIS
  ls [OPTION]... [FILE]...
DESCRIPTION
  List information about the FILES (the current directory by default).
  Sort entries alphabetically if none of -cftuvX nor --sort is specified.
  Mandatory arguments to long options are mandatory for short options too.
  -a, --all
    do not ignore entries starting with .
  -A, --almost-all
    do not list implied . and ..
  --author
    with -l, print the author of each file
  -b, --escape
    print C-style escapes for nongraphic characters
  --block-size=SIZE
    with -l, scale sizes by SIZE when printing them; e.g.,
    '--block-size=M'; see SIZE format below
  -B, --ignore-backups
    do not list implied entries ending with ~
  -c, with -lt: sort by, and show, ctime (time of last change of file
    status information); with -l show ctime and sort by name; other-
    wise sort by ctime, newest first
  -C
    list entries by columns
  --color[=WHEN]
    color the output WHEN; more info below
  -d, --directory
    manual page ls(1) line 1 (press h for help or q to quit)
```

ls --help

```
root@DESKTOP-GFUS3VG: ~
--help      display this help and exit
--version   output version information and exit

The SIZE argument is an integer and optional unit (example: 10K is 10*1024).
Units are K,M,G,T,P,E,Z,Y,R,Q (powers of 1024) or KB,MB,... (powers of 1000).
Binary prefixes can be used, too: KiB=K, MiB=M, and so on.

The TIME_STYLE argument can be full-iso, long-iso, iso, locale, or +FORMAT.
FORMAT is interpreted like in date(1). If FORMAT is FORMAT1<newline>FORMAT2,
then FORMAT1 applies to non-recent files and FORMAT2 to recent files.
TIME_STYLE prefixed with 'posix-' takes effect only outside the POSIX locale.
Also the TIME_STYLE environment variable sets the default style to use.

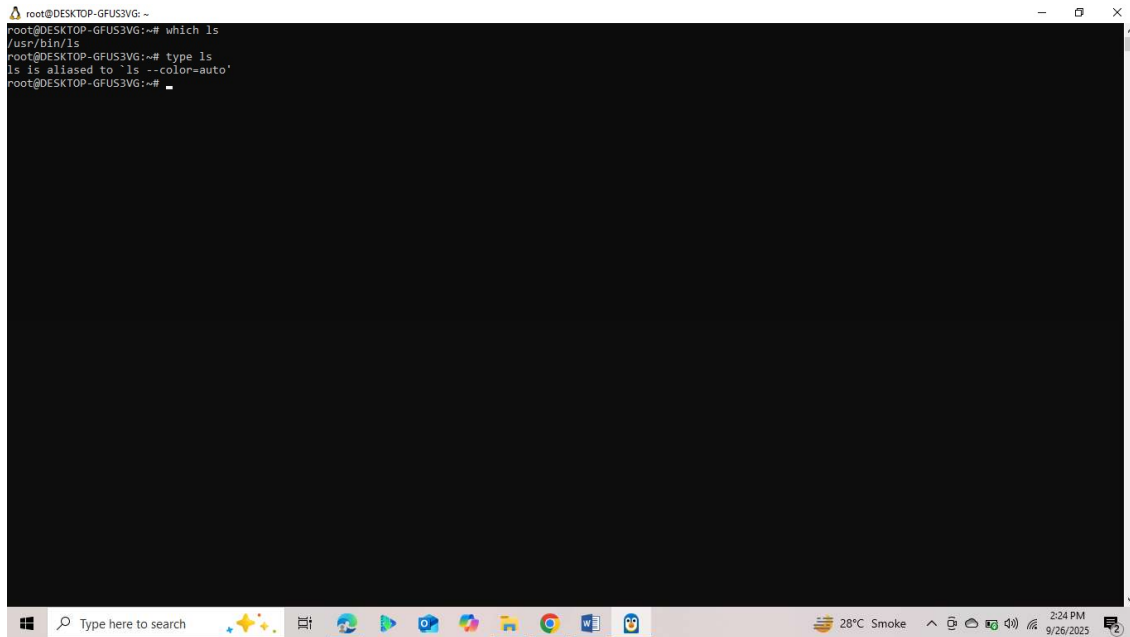
The WHEN argument defaults to 'always' and can also be 'auto' or 'never'.

Using color to distinguish file types is disabled both by default and
with --color=never. With --color=auto, ls emits color codes only when
standard output is connected to a terminal. The LS_COLORS environment
variable can change the settings. Use the dircolors(1) command to set it.

Exit status:
 0 if OK,
 1 if minor problems (e.g., cannot access subdirectory),
 2 if serious trouble (e.g., cannot access command-line argument).

GNU coreutils online help: <https://www.gnu.org/software/coreutils/>
Report any translation bugs to <https://translationproject.org/team/>
Full documentation <https://www.gnu.org/software/coreutils/ls>
or available locally via: info '(coreutils) ls invocation'
root@DESKTOP-GFUS3VG:~#
```

## Which ls and type ls



```
root@DESKTOP-GFUS3VG: ~  
root@DESKTOP-GFUS3VG:~# which ls  
/usr/bin/ls  
root@DESKTOP-GFUS3VG:~# type ls  
ls is aliased to 'ls --color=auto'  
root@DESKTOP-GFUS3VG:~#
```

## Part 2: File System Navigation

### 2.1 Understanding Linux Directory Structure

- **Concepts to Cover:**
  - Root directory (/)
  - Important directories: /home, /usr, /etc, /var, /tmp
  - Absolute vs relative paths
  - Hidden files and directories

- **Demonstration:**

```
ls /           # Root directory contents  
ls -la        # Long listing with hidden files  
cd /home      # Change directory  
cd ~          # Home directory shortcut  
cd -          # Previous directory
```

```
root@DESKTOP-GFUS3VG: /home
root@DESKTOP-GFUS3VG:~# ls /
bin boot etc init lib usr-is-merged lost+found mnt proc run sbin usr-is-merged srv tmp var
bin usr-is-merged dev home lib lib64 media opt root sbin snap sys usr
root@DESKTOP-GFUS3VG:~# ls -la
total 60
drwx----- 8 root root 4096 Sep 26 14:23 .
drwxr-xr-x 22 root root 4096 Sep 23 21:19 ..
-rw-r--r-- 1 root root 2707 Sep 26 14:23 .bash_history
-rw-r--r-- 1 root root 3106 Apr 22 2024 .bashrc
drwx----- 3 root root 4096 Sep 19 02:38 .cache
-rw-r--r-- 1 root root 50 Sep 19 14:28 .gitconfig
-rw-r--r-- 1 root root 20 Sep 26 14:23 .lesshst
drwxr-xr-x 3 root root 4096 Sep 23 22:38 .local
-rw-r--r-- 1 root root 0 Sep 26 13:32 .motd.shown
-rw-r--r-- 1 root root 161 Apr 22 2024 .profile
drwx----- 2 root root 4096 Sep 19 15:25 .ssh
drwxr-xr-x 5 root root 4096 Sep 19 02:38 .vscode-server
-rw-r--r-- 1 root root 183 Sep 19 14:10 .wget-hsts
drwxr-xr-x 4 root root 4096 Sep 23 22:13 Home_tasks_05_1149
-rw-r--r-- 1 root root 0 Sep 26 13:39 file.txt
drwxr-xr-x 2 root root 4096 Sep 26 13:42 folder
-rw-r--r-- 1 root root 90 Sep 23 22:32 hello.c
root@DESKTOP-GFUS3VG:~# cd /home
root@DESKTOP-GFUS3VG:/home# cd ~
root@DESKTOP-GFUS3VG:/home# cd -
/home
root@DESKTOP-GFUS3VG:/home#
```

## 2.2 Basic Navigation Commands (15 minutes)

- Commands to practice:

<code>pwd</code>	# Present working directory
<code>ls</code>	# List directory contents
<code>ls -l</code>	# Long format
<code>ls -la</code>	# Include hidden files
<code>ls -lh</code>	# Human readable sizes
<code>cd</code>	# Change directory
<code>cd ..</code>	# Parent directory
<code>cd ~</code>	# Home directory
<code>cd /</code>	# Root directory

Pwd,ls,ls -l ,ls -la

```
root@DESKTOP-GFUS3VG: /
root@DESKTOP-GFUS3VG:~# pwd
/
root@DESKTOP-GFUS3VG:~# ls
bin boot etc init lib usr-is-merged lost+found mnt proc run sbin usr-is-merged srv tmp var
bin usr-is-merged dev home lib lib64 media opt root sbin snap sys usr
root@DESKTOP-GFUS3VG:~# ls -l
total 2748
drwxr-xr-x 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 15 root root 3840 Sep 23 21:19 dev
drwxr-xr-x 88 root root 4096 Sep 26 14:23 etc
drwxr-xr-x 3 root root 4096 Sep 18 21:56 home
drwxr-xr-x 1 root root 2735264 Aug 6 12:54 init
drwxr-xr-x 1 root root 7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4096 Apr 8 2024 lib usr-is-merged
drwxr-xr-x 1 root root 9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16384 Sep 18 19:28 lost+found
drwxr-xr-x 2 root root 4096 Jan 6 2025 media
drwxr-xr-x 7 root root 4096 Sep 18 21:44 mnt
drwxr-xr-x 2 root root 4096 Jan 6 2025 opt
dr-xr-xr-x 193 root root 0 Sep 23 21:19 proc
drwx----- 8 root root 4096 Sep 26 14:23 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
drwxr-xr-x 1 root root 8 Apr 22 2024 sbin -> usr/sbin
drwxr-xr-x 2 root root 4096 Mar 31 2024 sbin usr-is-merged
drwxr-xr-x 2 root root 4096 Sep 18 10:35 snap
drwxr-xr-x 2 root root 4096 Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 23 21:19 sys
drwxrwxrwt 9 root root 4096 Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4096 Jan 6 2025 usr
drwxr-xr-x 13 root root 4096 Sep 18 21:44 var
root@DESKTOP-GFUS3VG:~# ls -la
total 2756
drwxr-xr-x 22 root root 4096 Sep 23 21:19 .
drwxr-xr-x 1 root root 4096 Sep 23 21:19 ..
drwxr-xr-x 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 15 root root 3840 Sep 23 21:19 dev
drwxr-xr-x 88 root root 4096 Sep 26 14:23 etc
drwxr-xr-x 3 root root 4096 Sep 18 21:56 home
drwxr-xr-x 1 root root 2735264 Aug 6 12:54 init
drwxr-xr-x 1 root root 7 Apr 22 2024 lib -> usr/lib
```

```
root@DESKTOP-GFUS3VG:/ # ls -lh
total 2.7M
drwxrwxrwx 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4.0K Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4.0K Apr 22 2024 boot
drwxr-xr-x 15 root root 3.8K Sep 23 21:19 dev
drwxr-xr-x 88 root root 4.0K Sep 26 14:23 etc
drwxr-xr-x 3 root root 4.0K Sep 18 21:56 home
-rwxrwxrwx 1 root root 2.7M Aug 6 12:54 init
drwxrwxrwx 1 root root 7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4.0K Apr 8 2024 lib.usr-is-merged
drwxrwxrwx 1 root root 9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16K Sep 18 19:28 lost+found
drwxr-xr-x 2 root root 4.0K Jan 6 2025 media
drwxr-xr-x 7 root root 4.0K Sep 18 21:44 mnt
drwxr-xr-x 2 root root 4.0K Jan 6 2025 opt
dr-xr-xr-x 193 root root 0 Sep 23 21:19 proc
drwx----- 8 root root 4.0K Sep 26 14:23 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
drwxrwxrwx 1 root root 8 Apr 22 2024 sbin -> usr/sbin
drwxr-xr-x 2 root root 4.0K Mar 31 2024 sbin.usr-is-merged
drwxr-xr-x 2 root root 4.0K Sep 18 19:35 snap
drwxr-xr-x 2 root root 4.0K Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 26 14:30 sys
drwxrwxrwt 9 root root 4.0K Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4.0K Jan 6 2025 usr
drwxr-xr-x 13 root root 4.0K Sep 18 21:44 var
root@DESKTOP-GFUS3VG:/ # cd ..
root@DESKTOP-GFUS3VG:/ #
```

## Part 3: File and Directory Operations

### \*\*3.1 Creating and Managing Files/Directories

- **Commands to demonstrate:**

```
mkdir mylab2           # Create directory
mkdir -p test/sub/dir  # Create nested directories
touch file1.txt        # Create empty file
touch file2.txt file3.txt # Multiple files

# Text editors introduction
nano hello.txt         # Simple text editor
# OR
echo "Hello Linux!" > hello.txt # Redirect output to file
```

- **File viewing commands:**

```
cat hello.txt          # Display file contents
less hello.txt         # Page through file
head hello.txt         # First 10 lines

tail hello.txt         # Last 10 lines
wc hello.txt           # Word count
```

```
root@DESKTOP-GFUS3VG: / # ls -lh
total 2.7M
drwxrwxrwx 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4.0K Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4.0K Apr 22 2024 boot
drwxr-xr-x 15 root root 3.8K Sep 23 21:19 dev
drwxr-xr-x 88 root root 4.0K Sep 26 14:23 etc
drwxr-xr-x 3 root root 4.0K Sep 18 21:56 home
-rwxrwxrwx 1 root root 2.7M Aug 6 12:54 init
drwxr-xr-x 1 root root 7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4.0K Apr 8 2024 lib.usr-is-merged
drwxrwxrwx 1 root root 9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16K Sep 18 19:28 lost+found
drwxr-xr-x 2 root root 4.0K Jan 6 2025 media
drwxr-xr-x 7 root root 4.0K Sep 18 21:44 mnt
drwxr-xr-x 2 root root 4.0K Jan 6 2025 opt
dr-xr-xr-x 193 root root 0 Sep 23 21:19 proc
drwx----- 8 root root 4.0K Sep 26 14:23 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
drwxrwxrwx 1 root root 8 Apr 22 2024 sbin -> usr/sbin
drwxr-xr-x 2 root root 4.0K Mar 31 2024 sbin.usr-is-merged
drwxr-xr-x 2 root root 4.0K Sep 18 18:35 snap
drwxr-xr-x 2 root root 4.0K Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 26 14:30 sys
drwxrwxrwt 9 root root 4.0K Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4.0K Jan 6 2025 usr
drwxr-xr-x 13 root root 4.0K Sep 18 21:44 var
root@DESKTOP-GFUS3VG: / # cd
root@DESKTOP-GFUS3VG: ~ # cd ..
root@DESKTOP-GFUS3VG: / #
```

## Less hello.txt interface:

```
root@DESKTOP-GFUS3VG: /
Hello Linux
hello.txt (END)
```

```
root@DESKTOP-GFUS3VG: /
GNU nano 7.2 hello.txt
Hello Linux
```

## 3.2 Copying, Moving, and Deleting

- Commands to practice:

```
cp hello.txt backup.txt      # Copy file
cp -r mylab2 mylab2_backup   # Copy directory recursively
mv backup.txt renamed.txt    # Move/rename file
rm renamed.txt               # Remove file
rm -r mylab2_backup          # Remove directory
rmdir empty_directory        # Remove empty directory
```

**Hands-on Exercise:** Students create a directory structure, add files, and practice file operations.

```
root@DESKTOP-GFUS3VG: /
1 2 12 hello.txt
root@DESKTOP-GFUS3VG: /# less hello.txt
root@DESKTOP-GFUS3VG: /#
root@DESKTOP-GFUS3VG: /# nano hello.txt
root@DESKTOP-GFUS3VG: /# nano hello.txt
root@DESKTOP-GFUS3VG: /# cp hello.txt backup.txt
root@DESKTOP-GFUS3VG: /# cp -r mylab2 mylab2_backup
root@DESKTOP-GFUS3VG: /# mv backup.txt renamed.txt
root@DESKTOP-GFUS3VG: /# rm renamed.txt
root@DESKTOP-GFUS3VG: /# rm -r mylab2_backup
root@DESKTOP-GFUS3VG: /# rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
root@DESKTOP-GFUS3VG: /#
```

```
root@DESKTOP-GFUS3VG: /
root@DESKTOP-GFUS3VG: /# mkdir emann
root@DESKTOP-GFUS3VG: /# ls
bin          emann      file3.txt  lib        media      proc       sbin       usr-is-merged  test
bin.usr-is-merged  etc       hello.txt  lib.usr-is-merged  mnt        root       snap       usr
boot        file1.txt  home      lib64      mylab2     run        srv        test
dev         file2.txt  init      lost+found  opt        sbin       sys        var
root@DESKTOP-GFUS3VG: /# cd emann
root@DESKTOP-GFUS3VG: /emann# cd..
cd.: command not found
root@DESKTOP-GFUS3VG: /emann# cd..
cd.: command not found
root@DESKTOP-GFUS3VG: /emann# cd..
root@DESKTOP-GFUS3VG: /# rm file1.txt
root@DESKTOP-GFUS3VG: /# rm file2.txt
root@DESKTOP-GFUS3VG: /# ls
bin          dev        file3.txt  init      lib64      mnt        proc       sbin       usr-is-merged  srv       test
bin.usr-is-merged  emann     hello.txt  lib       lib.usr-is-merged  media      opt        run        snap       sbin.usr-is-merged  sys       test
boot          etc       home      lib        lib.usr-is-merged  media      opt        run        snap       sbin.usr-is-merged  sys       test
root@DESKTOP-GFUS3VG: /# rmdir emann
root@DESKTOP-GFUS3VG: /# ls
bin          dev        hello.txt  lib       lib.usr-is-merged  lost+found  mylab2     root       sbin.usr-is-merged  sys       usr
bin.usr-is-merged  etc       home      lib        lib.usr-is-merged  media      opt        run        snap       sbin.usr-is-merged  sys       test
boot          file3.txt  init      lib64     mnt        proc       sbin       srv
root@DESKTOP-GFUS3VG: /#
```



```
root@DESKTOP-GFUS3VG: /mylabeman2
drwxr-xr-x 12 root root 4096 Jan 6 2025 usr
drwxr-xr-x 13 root root 4096 Sep 18 21:44 var
root@DESKTOP-GFUS3VG: /# mkdir mylabeman
root@DESKTOP-GFUS3VG: /# cd mylabeman2
root@DESKTOP-GFUS3VG: /# ls
bin      etc      init      lost+found  mylabeman  root      snap  tmp
bin.usr-is-merged file3.txt lib      media      mylabeman2  run      srv   usr
boot     hello.txt lib.usr-is-merged mnt      opt      sbin     sys   var
dev      home     lib64     mylab2     proc      sbin.usr-is-merged test

root@DESKTOP-GFUS3VG: /# cd mylabeman
root@DESKTOP-GFUS3VG: /mylabeman# touch emann.txt
root@DESKTOP-GFUS3VG: /mylabeman# cd..
cd.: command not found
root@DESKTOP-GFUS3VG: /mylabeman# cd ..
root@DESKTOP-GFUS3VG: /# cp -r mylabeman mylabeman2
root@DESKTOP-GFUS3VG: /# cd labeman2
-bash: cd: labeman2: No such file or directory
root@DESKTOP-GFUS3VG: /# cd mylabeman2
root@DESKTOP-GFUS3VG: /mylabeman2# ls
mylabeman
root@DESKTOP-GFUS3VG: /mylabeman2#

root@DESKTOP-GFUS3VG: /
root@DESKTOP-GFUS3VG: /mylabeman2# ls
mylabeman
root@DESKTOP-GFUS3VG: /mylabeman2# cd ..
root@DESKTOP-GFUS3VG: /# ls
bin      etc      init      lost+found  mylabeman  root      snap  tmp
bin.usr-is-merged file3.txt lib      media      mylabeman2  run      srv   usr
boot     hello.txt lib.usr-is-merged mnt      opt      sbin     sys   var
dev      home     lib64     mylab2     proc      sbin.usr-is-merged test

root@DESKTOP-GFUS3VG: /# rm -r mylabeman
root@DESKTOP-GFUS3VG: /# rm -r my labeman2
rm: cannot remove 'my': No such file or directory
rm: cannot remove 'labeman2': No such file or directory
root@DESKTOP-GFUS3VG: /# rm -r mylabeman2
root@DESKTOP-GFUS3VG: /# rm file3.txt
root@DESKTOP-GFUS3VG: /#
```

## Part 4: File Permissions and Ownership

### 4.1 Understanding File Permissions

- **Concepts to Cover:**
  - Permission types: read (r), write (w), execute (x)
  - Permission groups: user (u), group (g), others (o)
  - Numeric notation: 755, 644, etc.
- **Commands to demonstrate:**

```
ls -l           # View permissions
chmod 755 file.txt # Change permissions (numeric)
chmod u+x file.txt # Add execute permission for user
chmod g-w file.txt # Remove write permission for group
chown user:group file.txt # Change ownership (if applicable)
```

p

```
root@DESKTOP-GFUS3VG:/# ls -l
total 2760
lrwxrwxrwx 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 15 root root 3840 Sep 23 21:19 dev
drwxr-xr-x 88 root root 4096 Sep 26 14:23 etc
-rw-r--r-- 1 root root 0 Sep 26 14:35 file3.txt
-rw-r--r-- 1 root root 12 Sep 26 14:35 hello.txt
drwxr-xr-x 3 root root 4096 Sep 18 21:56 home
-rwxrwxrwx 1 root root 2735264 Aug 6 12:54 init
lrwxrwxrwx 1 root root 7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4096 Apr 8 2024 lib.usr-is-merged
lrwxrwxrwx 1 root root 9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16384 Sep 18 19:28 lost+found
drwxr-xr-x 2 root root 4096 Jan 6 2025 media
drwxr-xr-x 7 root root 4096 Sep 18 21:44 mnt
drwxr-xr-x 2 root root 4096 Sep 26 14:34 mylab2
drwxr-xr-x 2 root root 4096 Jan 6 2025 opt
dr-xr-xr-x 195 root root 0 Sep 23 21:19 proc
drwx----- 8 root root 4096 Sep 26 14:40 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
lrwxrwxrwx 1 root root 8 Apr 22 2024/sbin -> usr/sbin
drwxr-xr-x 2 root root 4096 Mar 31 2024/sbin.usr-is-merged
drwxr-xr-x 2 root root 4096 Sep 18 10:35 snap
drwxr-xr-x 2 root root 4096 Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 26 14:30 sys
drwxr-xr-x 3 root root 4096 Sep 26 14:34 test
drwxrwxrwt 9 root root 4096 Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4096 Jan 6 2025 usr
drwxr-xr-x 13 root root 4096 Sep 18 21:44 var
root@DESKTOP-GFUS3VG:/#
```

```
root@DESKTOP-GFUS3VG:/# ls -l
total 2760
lrwxrwxrwx 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 15 root root 3840 Sep 23 21:19 dev
drwxr-xr-x 88 root root 4096 Sep 26 14:23 etc
-rw-r--r-- 1 root root 0 Sep 26 14:35 file3.txt
-rw-r--r-- 1 root root 12 Sep 26 14:35 hello.txt
drwxr-xr-x 3 root root 4096 Sep 18 21:56 home
-rwxrwxrwx 1 root root 2735264 Aug 6 12:54 init
lrwxrwxrwx 1 root root 7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4096 Apr 8 2024 lib.usr-is-merged
lrwxrwxrwx 1 root root 9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16384 Sep 18 19:28 lost+found
drwxr-xr-x 2 root root 4096 Jan 6 2025 media
drwxr-xr-x 7 root root 4096 Sep 18 21:44 mnt
drwxr-xr-x 2 root root 4096 Sep 26 14:34 mylab2
drwxr-xr-x 2 root root 4096 Jan 6 2025 opt
dr-xr-xr-x 195 root root 0 Sep 23 21:19 proc
drwx----- 8 root root 4096 Sep 26 14:40 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
lrwxrwxrwx 1 root root 8 Apr 22 2024/sbin -> usr/sbin
drwxr-xr-x 2 root root 4096 Mar 31 2024/sbin.usr-is-merged
drwxr-xr-x 2 root root 4096 Sep 18 10:35 snap
drwxr-xr-x 2 root root 4096 Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 26 14:30 sys
drwxr-xr-x 3 root root 4096 Sep 26 14:34 test
drwxrwxrwt 9 root root 4096 Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4096 Jan 6 2025 usr
drwxr-xr-x 13 root root 4096 Sep 18 21:44 var
root@DESKTOP-GFUS3VG:/# chmod 755 file3.txt
root@DESKTOP-GFUS3VG:/# ls -l
total 2760
lrwxrwxrwx 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 15 root root 3840 Sep 23 21:19 dev
drwxr-xr-x 88 root root 4096 Sep 26 14:23 etc
-rw-r--r-- 1 root root 0 Sep 26 14:35 file3.txt
-rw-r--r-- 1 root root 12 Sep 26 14:35 hello.txt
drwxr-xr-x 3 root root 4096 Sep 18 21:56 home
-rwxrwxrwx 1 root root 2735264 Aug 6 12:54 init
lrwxrwxrwx 1 root root 7 Apr 22 2024 lib -> usr/lib
```

```
root@DESKTOP-GFUS3VG:/#
drwx----- 8 root root 4096 Sep 26 14:40 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
lrwxrwxrwx 1 root root 8 Apr 22 2024/sbin -> usr/sbin
drwxr-xr-x 2 root root 4096 Mar 31 2024/sbin.usr-is-merged
drwxr-xr-x 2 root root 4096 Sep 18 10:35 snap
drwxr-xr-x 2 root root 4096 Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 26 14:30 sys
drwxr-xr-x 3 root root 4096 Sep 26 14:34 test
drwxrwxrwt 9 root root 4096 Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4096 Jan 6 2025 usr
drwxr-xr-x 13 root root 4096 Sep 18 21:44 var
root@DESKTOP-GFUS3VG:/# sudo chmod g-w file3.txt
root@DESKTOP-GFUS3VG:/# ls -l
total 2760
lrwxrwxrwx 1 root root 7 Apr 22 2024 bin -> usr/bin
drwxr-xr-x 2 root root 4096 Feb 26 2024 bin.usr-is-merged
drwxr-xr-x 2 root root 4096 Apr 22 2024 boot
drwxr-xr-x 15 root root 3840 Sep 23 21:19 dev
drwxr-xr-x 88 root root 4096 Sep 26 14:23 etc
-rw-r--r-- 1 root root 0 Sep 26 14:35 file3.txt
-rw-r--r-- 1 root root 12 Sep 26 14:35 hello.txt
drwxr-xr-x 3 root root 4096 Sep 18 21:56 home
-rwxrwxrwx 1 root root 2735264 Aug 6 12:54 init
lrwxrwxrwx 1 root root 7 Apr 22 2024 lib -> usr/lib
drwxr-xr-x 2 root root 4096 Apr 8 2024 lib.usr-is-merged
lrwxrwxrwx 1 root root 9 Apr 22 2024 lib64 -> usr/lib64
drwx----- 2 root root 16384 Sep 18 19:28 lost+found
drwxr-xr-x 2 root root 4096 Jan 6 2025 media
drwxr-xr-x 7 root root 4096 Sep 18 21:44 mnt
drwxr-xr-x 2 root root 4096 Sep 26 14:34 mylab2
drwxr-xr-x 2 root root 4096 Jan 6 2025 opt
dr-xr-xr-x 194 root root 0 Sep 23 21:19 proc
drwx----- 8 root root 4096 Sep 26 14:40 root
drwxr-xr-x 20 root root 620 Sep 26 13:32 run
lrwxrwxrwx 1 root root 8 Apr 22 2024/sbin -> usr/sbin
drwxr-xr-x 2 root root 4096 Mar 31 2024/sbin.usr-is-merged
drwxr-xr-x 2 root root 4096 Sep 18 10:35 snap
drwxr-xr-x 2 root root 4096 Jan 6 2025 srv
dr-xr-xr-x 13 root root 0 Sep 26 14:30 sys
drwxr-xr-x 3 root root 4096 Sep 26 14:34 test
drwxrwxrwt 9 root root 4096 Sep 26 13:49 tmp
drwxr-xr-x 12 root root 4096 Jan 6 2025 usr
drwxr-xr-x 13 root root 4096 Sep 18 21:44 var
root@DESKTOP-GFUS3VG:/#
```

## Part 5: Text Processing and Utilities

### 5.1 Essential Text Commands

- **Commands to demonstrate:**

```
grep "pattern" file.txt      # Search for patterns
grep -i "pattern" file.txt   # Case-insensitive search
grep -n "pattern" file.txt   # Show line numbers
```

### 5.2 Pipes and Redirection

- **Concepts and commands:**

```
ls -l | grep ".txt"         # Pipe output
cat file1.txt file2.txt > combined.txt # Redirect output
echo "new line" >> file.txt  # Append to file
sort file.txt | uniq        # Chain commands
```

---

## Part 6: Introduction to Processes

### 6.1 Understanding Processes

- **Concepts to Cover:**
  - What is a process?
  - Process ID (PID)
  - Parent-child relationships
  - Process states
- **Commands to demonstrate:**

```
ps                # Show current processes
ps aux            # Detailed process list
ps -ef            # Full format listing
pstree            # Process tree
top               # Real-time process viewer
htop              # Enhanced process viewer (if available)
kill PID          # Terminate process by PID
killall process_name # Kill processes by name
pkill pattern     # Kill processes matching pattern
```