1-

```
fabio@LAPTOP-M3JQR46L:~$ ls -l /usr | grep '^d'
drwxr-xr-x   2 root root 24576 Nov 29 14:38 bin
drwxr-xr-x   2 root root  4096 Apr 18  2022 games
drwxr-xr-x   4 root root  4096 Sep 27 22:36 include
drwxr-xr-x  63 root root  4096 Nov 28 11:08 lib
drwxr-xr-x   2 root root  4096 Sep 27 22:35 lib32
drwxr-xr-x   2 root root  4096 Sep 27 22:36 lib64
drwxr-xr-x   8 root root  4096 Sep 27 22:36 libexec
drwxr-xr-x   2 root root  4096 Sep 27 22:35 libx32
drwxr-xr-x  10 root root  4096 Sep 27 22:35 local
drwxr-xr-x   2 root root 12288 Nov 28 11:08 sbin
drwxr-xr-x 102 root root  4096 Sep 27 22:36 share
drwxr-xr-x   2 root root  4096 Apr 18  2022 src
```

2-a)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep '^X' example.txt
X
Xarroz
Xadrez
Xxpto
```

b)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep 'xpto$' example.txt
xpto
souxpto
Xxpto
```

c)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep -E '^X|xpto$' example.txt
X
xpto
Xarroz
souxpto
Xadrez
Xxpto
```

d)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep '^principios.*computacao$' examp
le.txt
principios computacao
```

3- a)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ nano classifications.csv
```

b) The $ symbol ensures that "Lebre" appears at the end of the name

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep 'Lebre$' classifications.csv
2 1;2:04:23; Jo ˜a o Lebre
```

c)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep '^.*;.*;Manuel' classifications.csv
1 2;2:05:25;Manuel Torpedo
```

d)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ sort -t ';' -k2,2 classifications.csv
 | head -n 5

2 1;2:04:23;Jo ˜a o Lebre
1 2;2:05:25;Manuel Torpedo
4 13;2:16:03;Passos Dias Aguiar Mota
3 15;2:20:15;Henrique Labareda
```

e)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ sort -t ';' -k2,2 classifications.csv
 | head -n 5 | awk -F ';' '{print $2 "\t" $3}'

2:04:23 Jo ˜a o Lebre
2:05:25 Manuel Torpedo
2:16:03 Passos Dias Aguiar Mota
2:20:15 Henrique Labareda
```

f)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ awk -F ';' '$2 < "2:20:00" {print $2
"\t" $3}' classifications.csv
2:05:25 Manuel Torpedo
2:04:23 Jo ˜a o Lebre
2:16:03 Passos Dias Aguiar Mota
```

g)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ awk -F ';' '$2 < "2:20:00" {count+
+} END {print count}' classifications.csv
4
```

4-

a) The -n option in grep prints each matching line with its line number in the file.
b) The -B num option prints num lines of trailing context **before** each match.
c) The -A num option prints num lines of trailing context **after** each match.
d) The -C num option combines both -B and -A options, printing num lines of context **before** and **after** each match.
e) The -m num option causes grep to stop reading a file after finding num matching lines.
f) The -q option is useful when you only want to know whether a match exists or not, without displaying the matching lines. It returns a zero exit status if a match is found and a non-zero exit status if no match is found.
g) The -i option makes grep perform a case-insensitive search, so it will match both uppercase and lowercase characters.

5- grep -P "^\d{4}-\d{3}\s[A-Za-z0-9\s\.,-]{1,25}$" test_postal_codes.txt

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ nano test_postal_codes.txt
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep -P "^\d{4}-\d{3}\s[A-Za-z0-9\s\.,-]{1,25}$" test_postal_codes.
1234-567 Lisboa
1000-001 Lisbon
4500-678 Porto, Portugal
1234-000 Almada
9876-543 Coimbra, University
1111-222 Example Street
```

6-grep -P "^\+351\s(\d{3}\s?\d{3}\s?\d{3}|\d{2}\s?\d{3}\s?\d{4}|\d{9})$" test_phone_numbers.txt

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ grep -P "^\+351\s(\d{3}\s?\d{3}\s?\d{3}|\d{2}\s?\d{3}\s?\d{4}|\d{9})$" test_phones.txt
+351 999 999 999
+351 99 999 9999
+351 999999999
```

7-

a) **-name**: The -name option is case-sensitive when searching for files or directories by name. This means that if you specify a pattern, it will only match files that exactly match the pattern in terms of case.

   -iname: The -iname option works the same way as -name, but **it is case-insensitive**. This means it will match files regardless of case.

b) **-mtime**: The -mtime option is used to find files based on the **last modification time**. It accepts the following format:
   -mtime +n: Files modified **more than n days ago**.
   -mtime -n: Files modified **less than n days ago**.
   -mtime n: Files modified exactly **n days ago**.
   Creating periodic backups: To create periodic backups, you could use the -mtime option to select files that were modified within a specific time range.

c) **-size**: The -size option is used to find files based on their size. You can use it in the following formats:
   -size +n: Files that are **larger** than n units.
   -size -n: Files that are **smaller** than n units.
   -size n: Files that are exactly n units in size.
   The size units can be specified as:
   b for 512-byte blocks (default).
   k for kilobytes.
   M for megabytes.
   G for gigabytes, etc.

d) **Regular file identifier**: The identifier for a regular file is **-type f**. This option selects only regular files (not directories, symbolic links, or other special file types).
   Directory identifier: The identifier for a directory is **-type d**. This option selects directories (not regular files, symbolic links, etc.).

8-

```
fabio@LAPTOP-M3JQR46L:~$ find ~ -type f -name "*.txt"
/home/fabio/result2.txt
/home/fabio/manual_ls_sorted.txt
/home/fabio/tr.txt
/home/fabio/FileUtilities/docs/sorted_words.txt
/home/fabio/FileUtilities/docs/duplicate.txt
/home/fabio/FileUtilities/docs/long.txt
/home/fabio/FileUtilities/docs/man_ls.txt
/home/fabio/FileUtilities/docs/dumdum.txt
/home/fabio/FileUtilities/docs/words.txt
/home/fabio/FileUtilities/WorksOfShakespeare.txt
/home/fabio/FileUtilities/ficheiro2.txt
/home/fabio/FileUtilities/example.txt
/home/fabio/FileUtilities/ficheiro1.txt
/home/fabio/FileUtilities/test_phones.txt
/home/fabio/FileUtilities/test_postal_codes.txt
```

9-

```
fabio@LAPTOP-M3JQR46L:~$ find /usr/bin -type f -size +200k
/usr/bin/ssh-keygen
/usr/bin/git
/usr/bin/pic
/usr/bin/find
/usr/bin/cvtsudoers
/usr/bin/dirmngr
/usr/bin/openssl
/usr/bin/dpkg
/usr/bin/systemd-analyze
/usr/bin/curl
```

Yes, the find command in this case will only search **within the /bin directory** and its **subdirectories** (recursively). The search will not extend to other directories outside /bin.

10-

```
fabio@LAPTOP-M3JQR46L:~$ find ~ -type d
/home/fabio
/home/fabio/.landscape
/home/fabio/.cache
/home/fabio/FileUtilities
/home/fabio/FileUtilities/docs
/home/fabio/.local
/home/fabio/.local/share
/home/fabio/.local/share/nano
```

11-

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ find ~ -maxdepth 1 -type d
/home/fabio
/home/fabio/.landscape
/home/fabio/.cache
/home/fabio/FileUtilities
/home/fabio/.local
```

12 –

a)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ find -type f -mtime +3
./table.csv
./docs/sorted_words.txt
./docs/duplicate.txt
./docs/long.txt
./docs/man_ls.txt
./docs/dumdum.txt
./docs/file.tmp
./docs/dummy.pdf
./docs/words.txt
./classifications.csv
./WorksOfShakespeare.txt
./ficheiro2.txt
./example.txt
./ficheiro1.txt
```

b)

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ find /bin /usr/bin -type f -atime +10
```

13-

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ find -type f \( -name 'f*' -o -name 'p*' -o -name 'c*' \) -exec cp {} /tmp \;
```

14-

```
fabio@LAPTOP-M3JQR46L:~/FileUtilities$ find /tmp -type f -atime -2 -exec rm -i {} \;
```