IUS
INSTITUT
UNIVERSITAIRE
DES SCIENCES

Faculté des Sciences et Technologie

(FST)

Niveau : L3-FST

Systèmes

Soumis au chargé de cours : Ismaël SAINT AMOUR

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Date : 06 Février 2025

Systèmes d'exploitation Linux

Programmation Avancée avec Bash.

TD 9

Objectif :

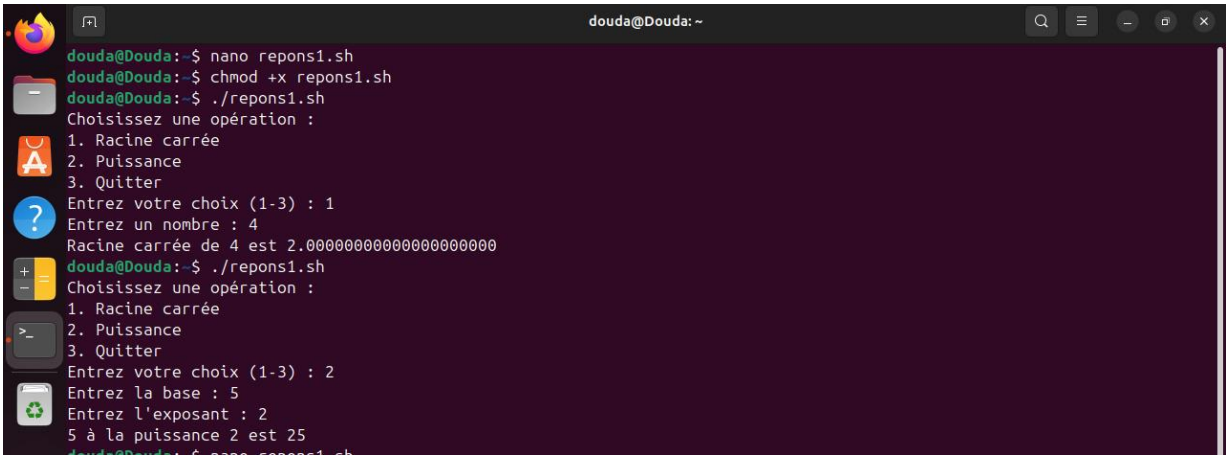
Ce TD explore les concepts avancés de programmation en Bash, tels que les fonctions, les opérations logiques, les graphes, et les bases de données.

Matériel Nécessaire :

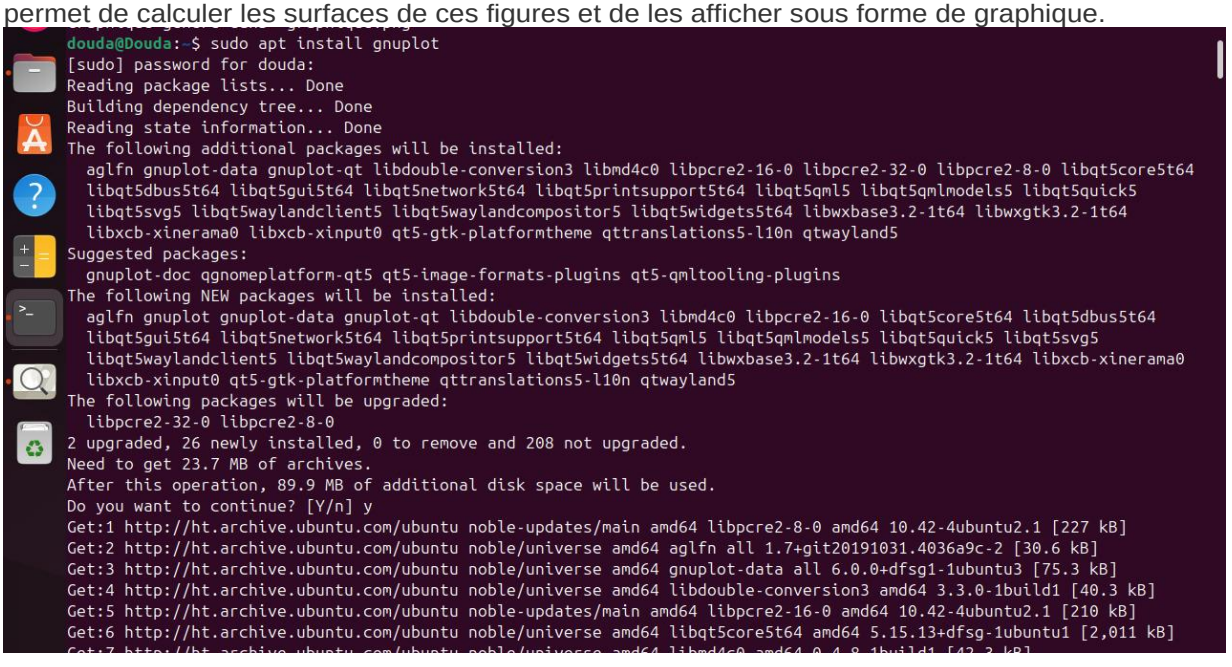
- Un ordinateur avec Linux installé ou une machine virtuelle avec une distribution Linux (comme Ubuntu).
- Accès au terminal.
- Accès à Internet.

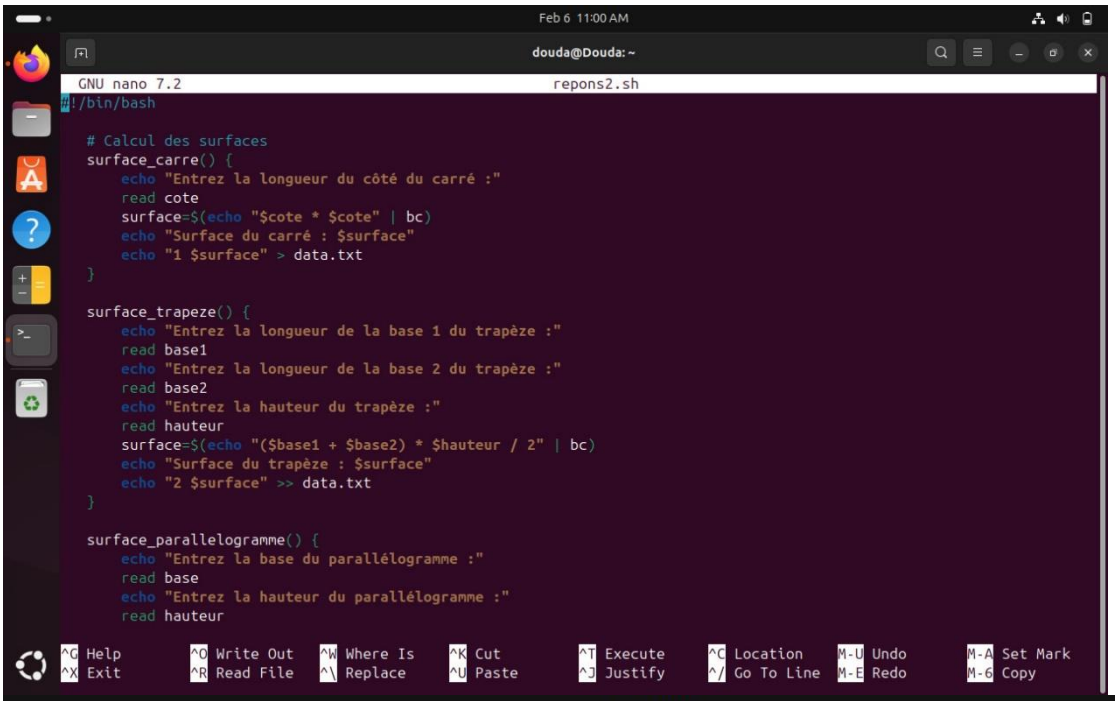
TD9

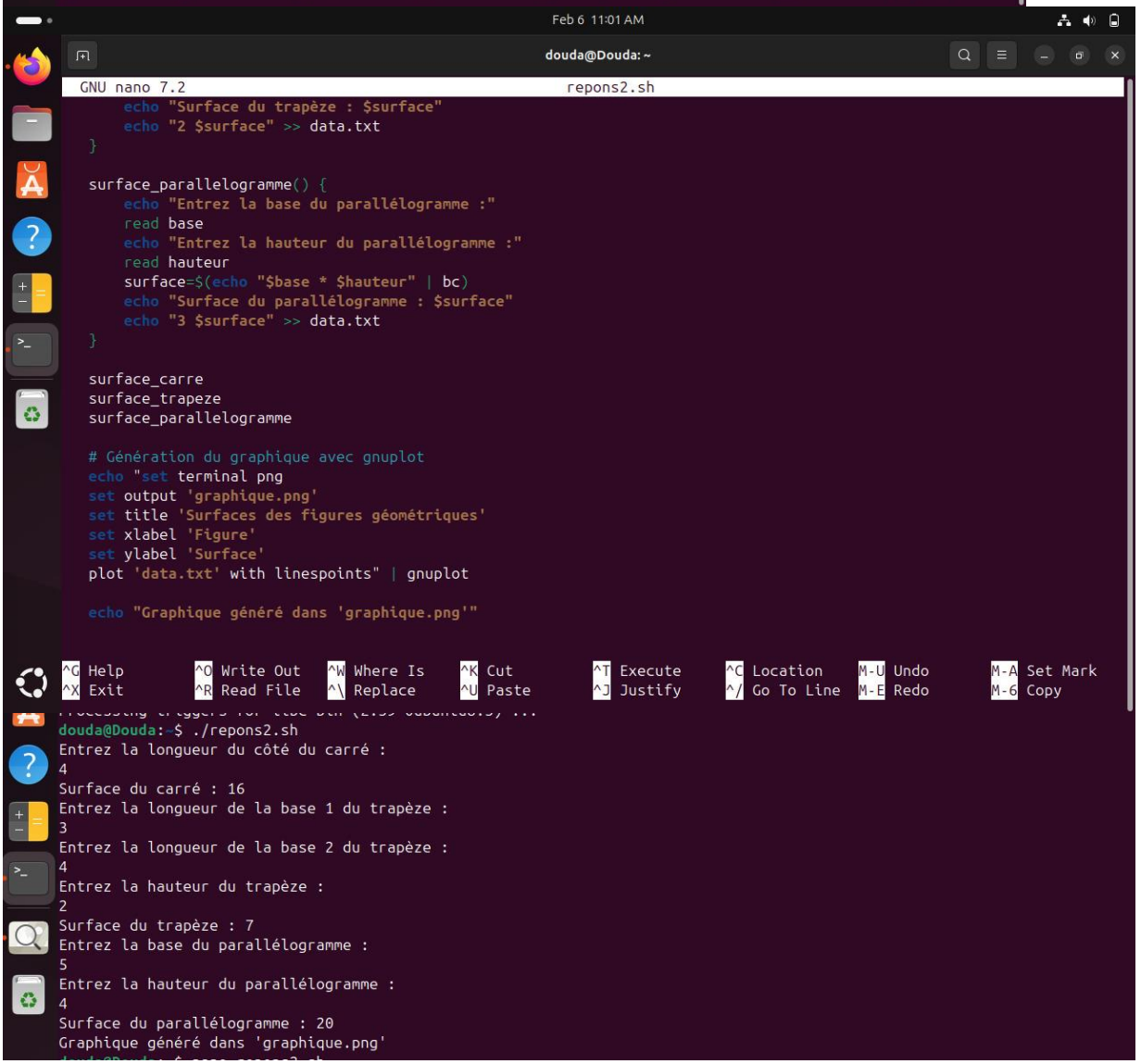
1. Créez un script avec un menu interactif permettant de choisir l'opération à effectuer (racine carrée, puissance, etc.).

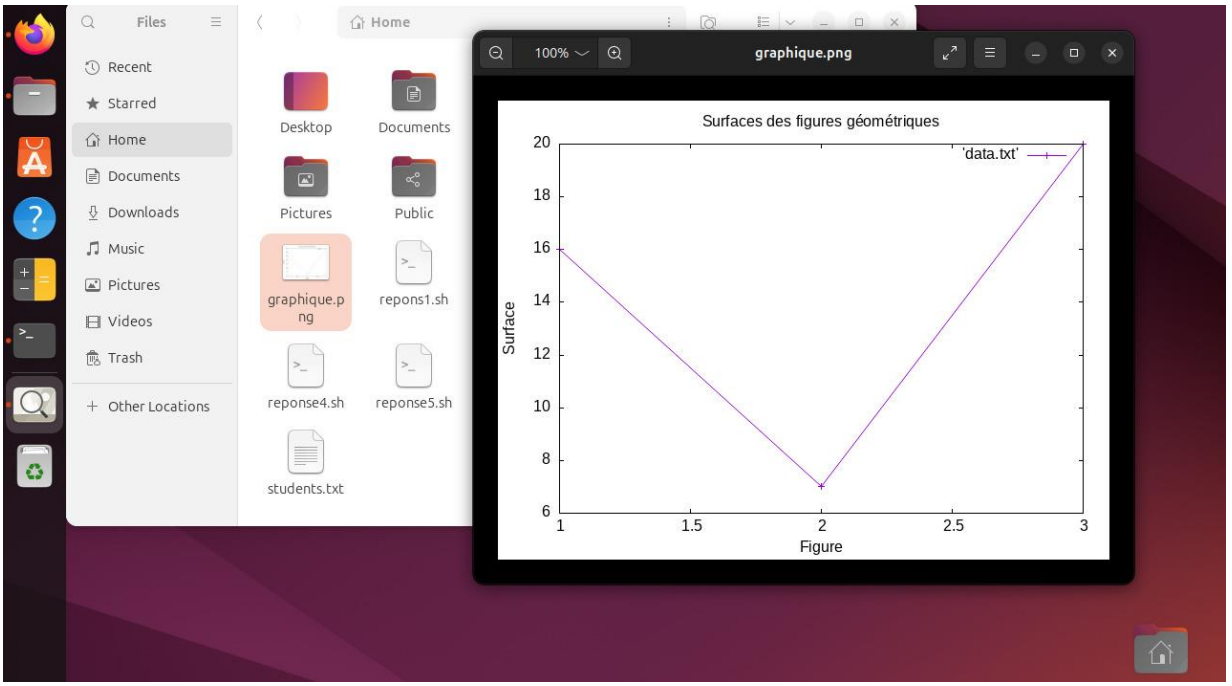


2. Créez un script Bash qui génère un graphique représentant les surfaces de figures géométriques simples (carré, trapèze, parallélogramme) à l'aide de `gnuplot`. Ce script permet de calculer les surfaces de ces figures et de les afficher sous forme de graphique.

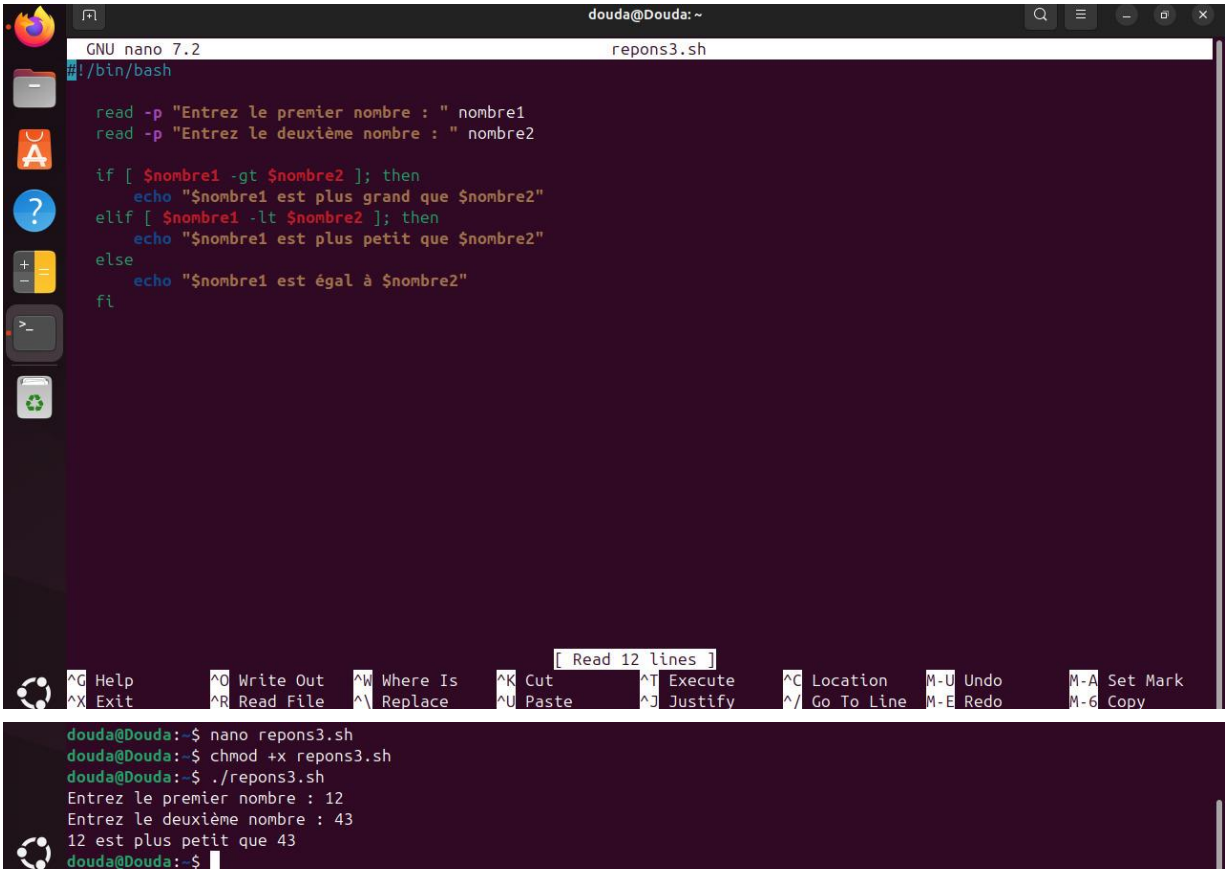



Feb 6 11:00 AM
douda@Douda: ~
GNU nano 7.2 repons2.sh
#!/bin/bash
# Calcul des surfaces
surface_carre() {
echo "Entrez la longueur du côté du carré :"
read cote
surface=$(echo "$cote * $cote" | bc)
echo "Surface du carré : $surface"
echo "1 $surface" > data.txt
}
surface_trapeze() {
echo "Entrez la longueur de la base 1 du trapèze :"
read base1
echo "Entrez la longueur de la base 2 du trapèze :"
read base2
echo "Entrez la hauteur du trapèze :"
read hauteur
surface=$(echo "($base1 + $base2) * $hauteur / 2" | bc)
echo "Surface du trapèze : $surface"
echo "2 $surface" >> data.txt
}
surface_parallelogramme() {
echo "Entrez la base du parallélogramme :"
read base
echo "Entrez la hauteur du parallélogramme :"
read hauteur
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location M-U Undo M-A Set Mark
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^/ Go To Line M-E Redo M-6 Copy


Feb 6 11:01 AM
douda@Douda: ~
GNU nano 7.2 repons2.sh
echo "Surface du trapèze : $surface"
echo "2 $surface" >> data.txt
}
surface_parallelogramme() {
echo "Entrez la base du parallélogramme :"
read base
echo "Entrez la hauteur du parallélogramme :"
read hauteur
surface=$(echo "$base * $hauteur" | bc)
echo "Surface du parallélogramme : $surface"
echo "3 $surface" >> data.txt
}
surface_carre
surface_trapeze
surface_parallelogramme
Génération du graphique avec gnuplot
echo "set terminal png
set output 'graphique.png'
set title 'Surfaces des figures géométriques'
set xlabel 'Figure'
set ylabel 'Surface'
plot 'data.txt' with linespoints" | gnuplot
echo "Graphique généré dans 'graphique.png'"
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location M-U Undo M-A Set Mark
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^/ Go To Line M-E Redo M-6 Copy
douda@Douda:~$ ./repons2.sh
Entrez la longueur du côté du carré :
4
Surface du carré : 16
Entrez la longueur de la base 1 du trapèze :
3
Entrez la longueur de la base 2 du trapèze :
4
Entrez la hauteur du trapèze :
2
Surface du trapèze : 7
Entrez la base du parallélogramme :
5
Entrez la hauteur du parallélogramme :
4
Surface du parallélogramme : 20
Graphique généré dans 'graphique.png'

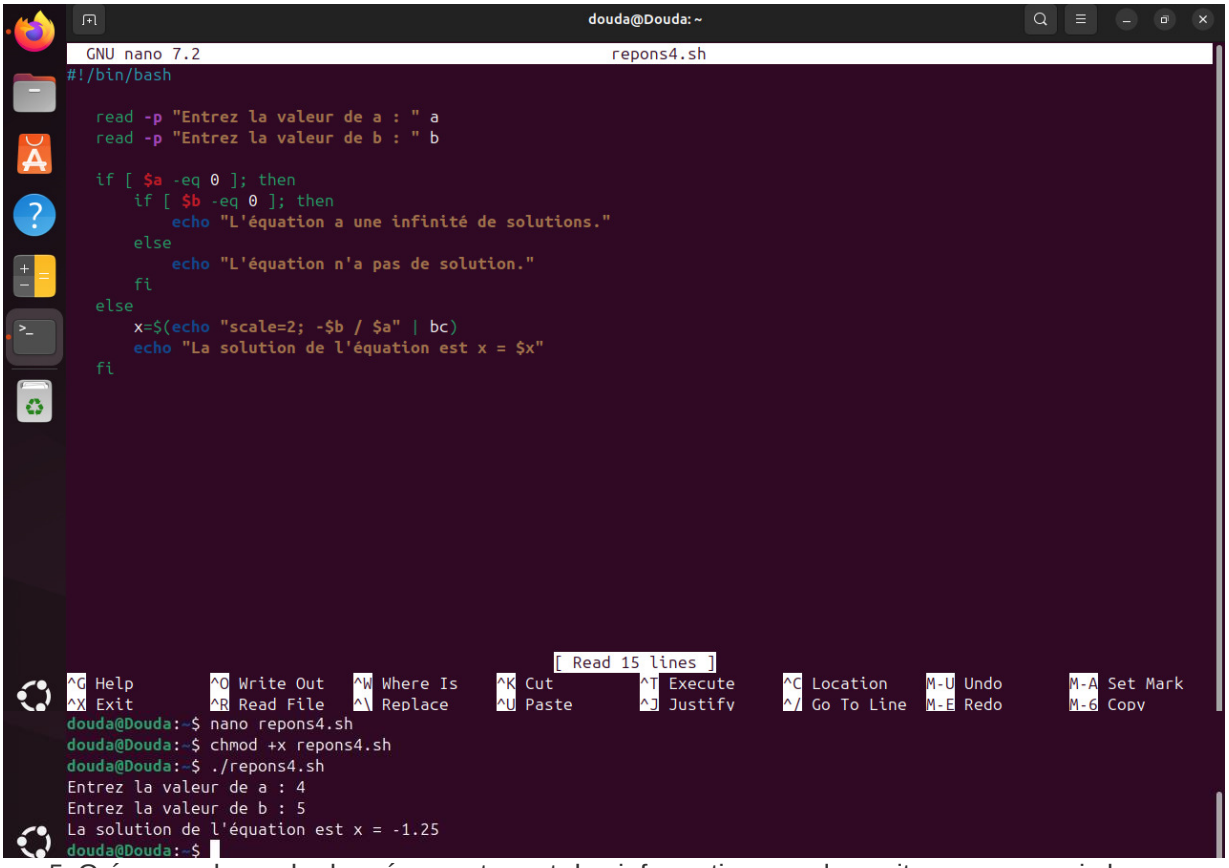


3. Créez un script Bash pour comparer deux nombres en utilisant ces opérateurs et affichez un message à la fin duscript.

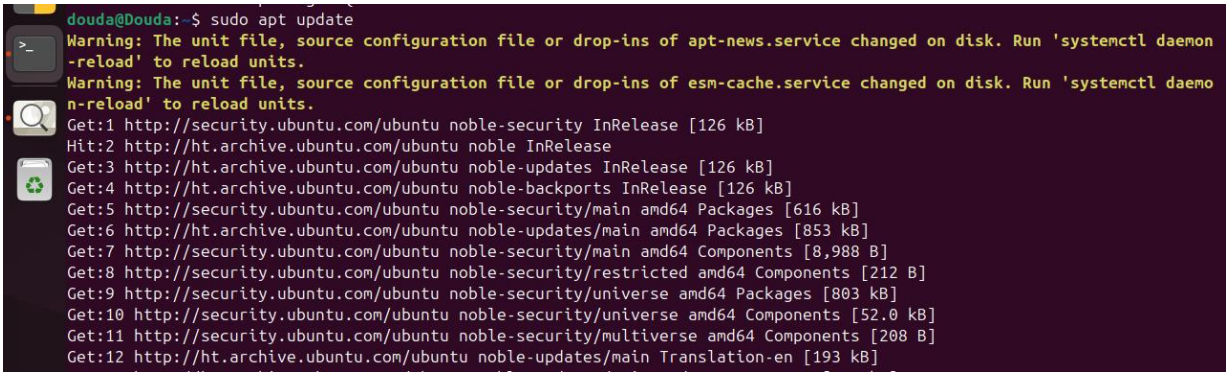


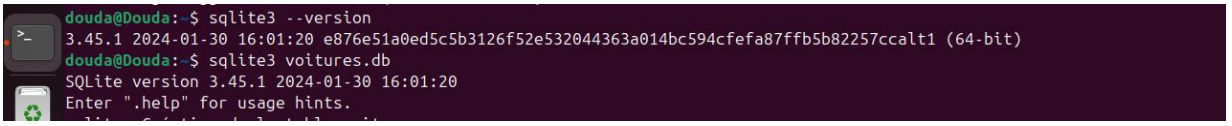
4. Créez un script Bash pour résoudre une équation sous la forme

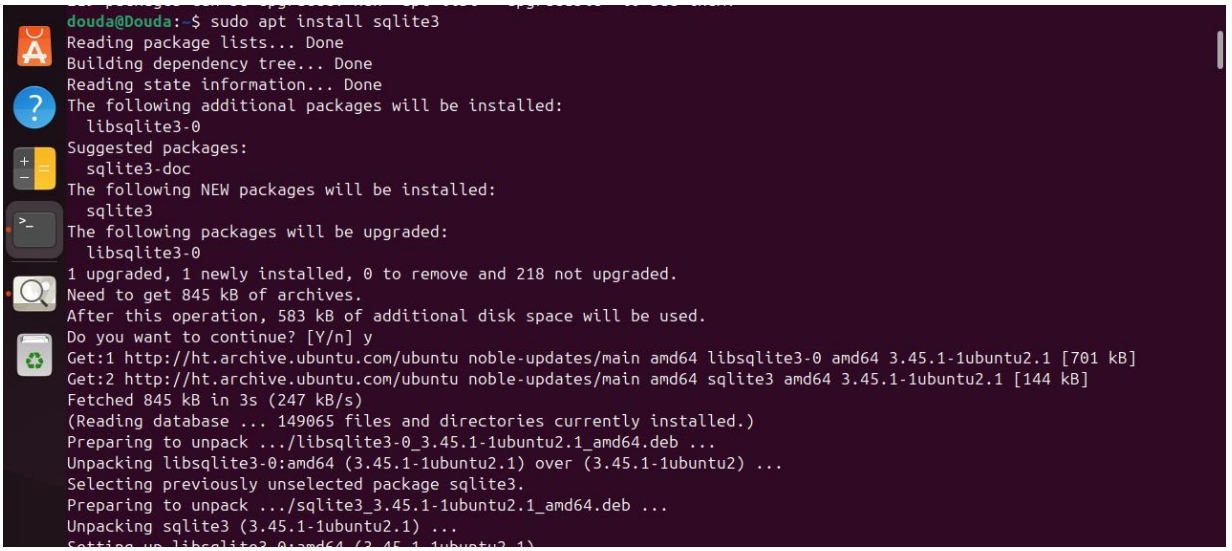
$$ax + b = 0$$



5. Créez une base de données contenant des informations sur les voitures, y compris les marques, les numéros de plaques d'immatriculation et les informations sur les propriétaires. Vous pouvez utiliser SQL, PostgreSQL ou SQLite.



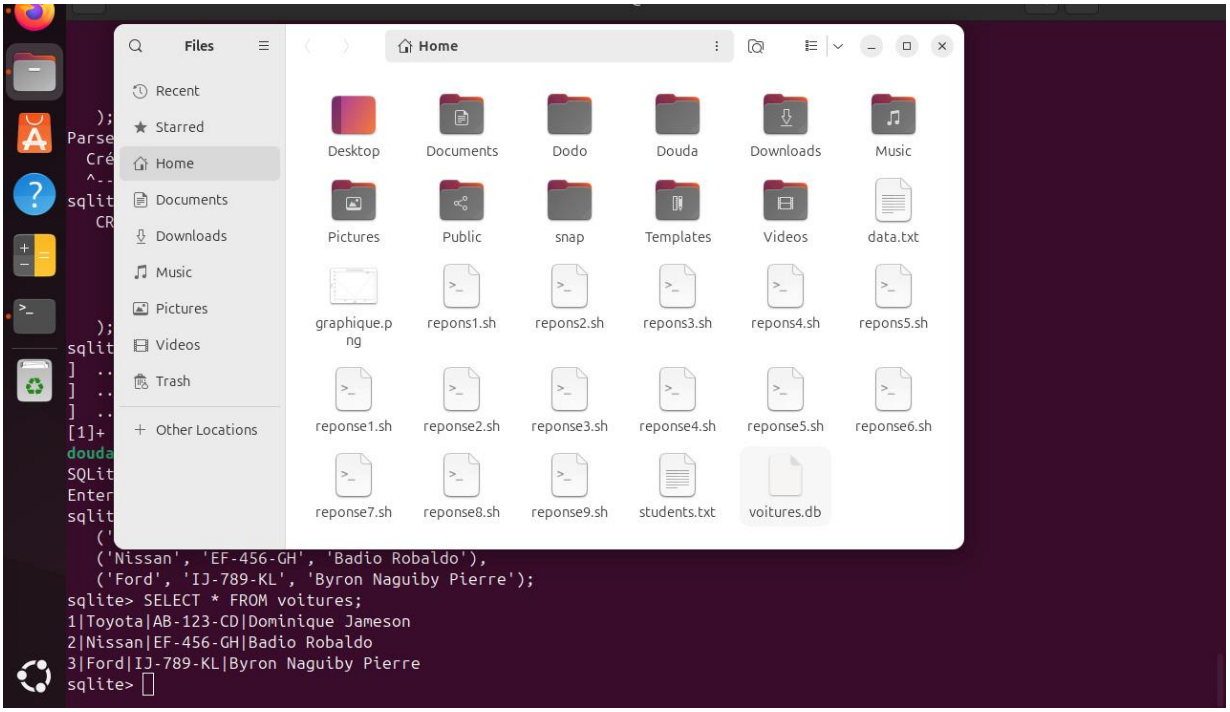




```
sqlite> INSERT INTO voitures (marque, plaque_immatriculation, proprietaire) VALUES
   ('Toyota', 'AB-123-CD', 'Dominique Jameson'),
   ('Nissan', 'EF-456-GH', 'Badio Robaldo'),
   ('Ford', 'IJ-789-KL', 'Byron Naguiby Pierre');
sqlite> SELECT * FROM voitures;
1|Toyota|AB-123-CD|Dominique Jameson
2|Nissan|EF-456-GH|Badio Robaldo
3|Ford|IJ-789-KL|Byron Naguiby Pierre
sqlite>
```

```
sqlite>
   CREATE TABLE voitures (
       id INTEGER PRIMARY KEY AUTOINCREMENT,
       marque TEXT NOT NULL,
       plaque_immatriculation TEXT NOT NULL,
       proprietaire TEXT NOT NULL
   );
```

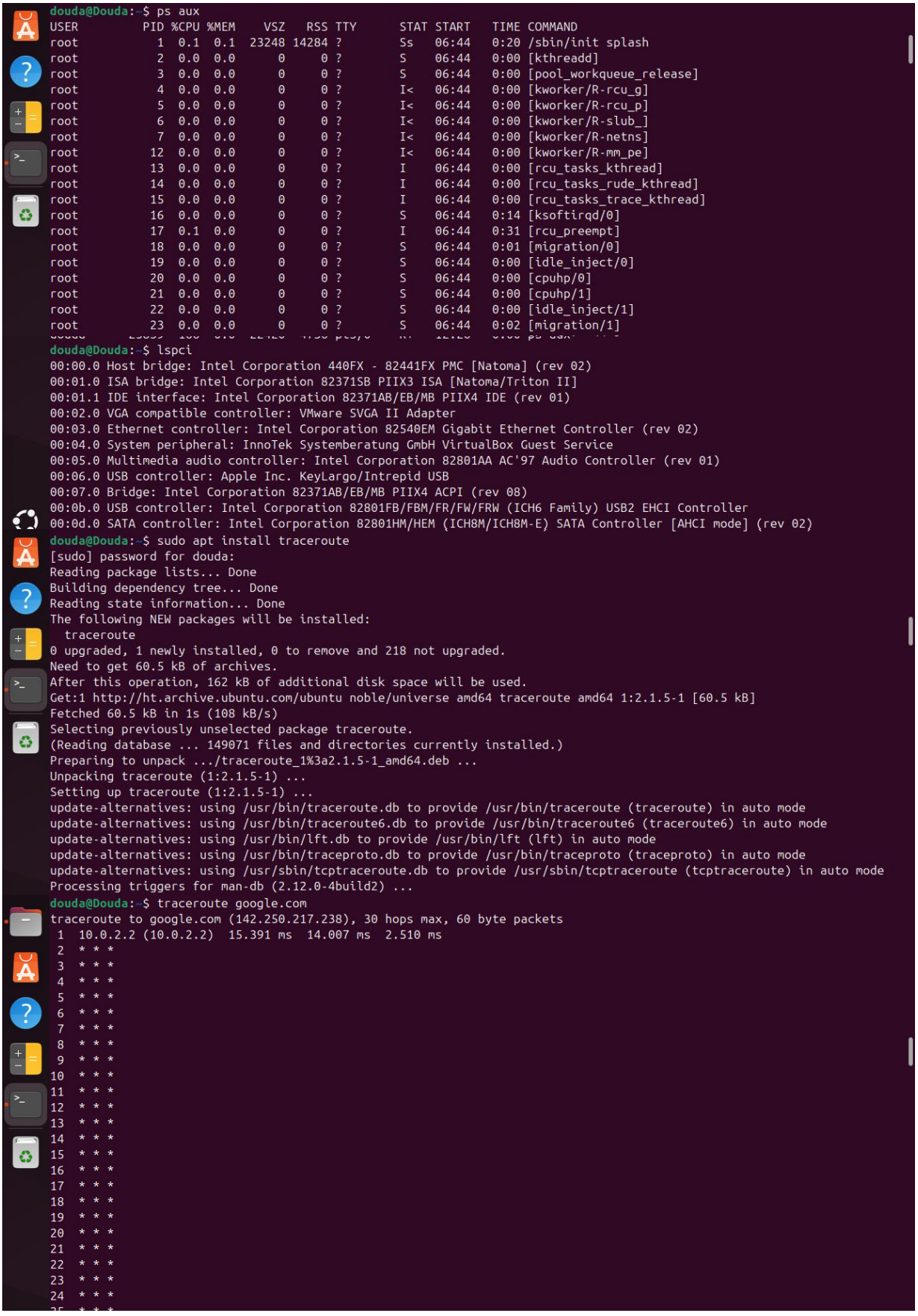
```
douda@Douda:~$ sqlite3 --version
3.45.1 2024-01-30 16:01:20 e876e51a0ed5c5b3126f52e532044363a014bc594cfefa87ffb5b82257ccalt1 (64-bit)
```

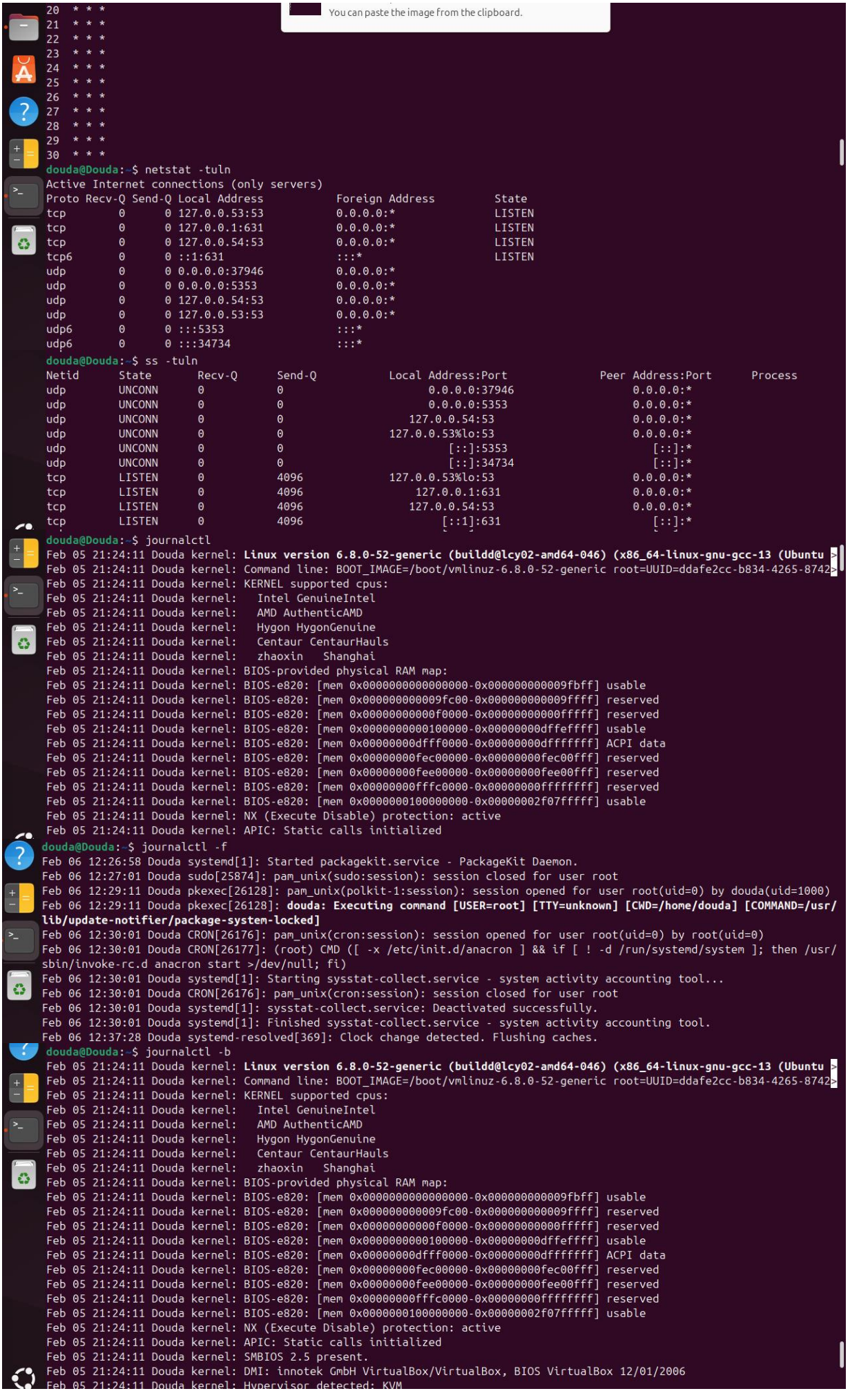


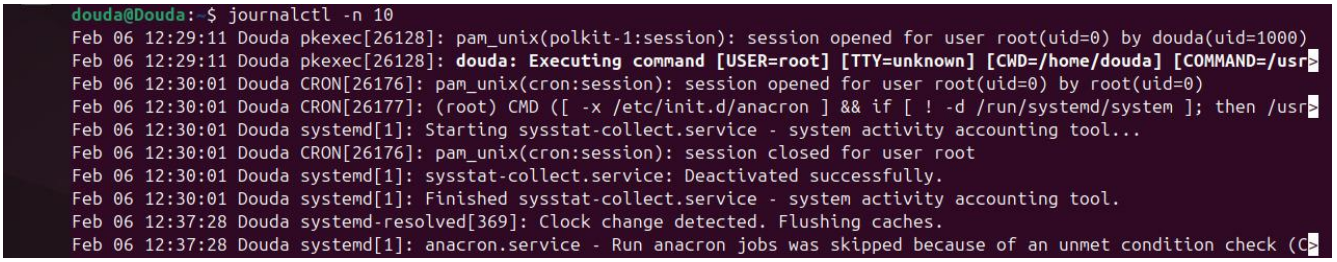
6. Exécuter ces commandes

```
df -h
du -sh
free -h
ps aux
lspci
sudo apt install traceroute
traceroute google.com
netstat -tuln
ss -tuln
journalctl
journalctl -f
journalctl -b
journalctl -n 10
```

```
douda@Douda:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           1.1G  1.7M  1.1G   1% /run
/dev/sda2        49G  5.5G   41G  12% /
tmpfs           5.5G     0  5.5G   0% /dev/shm
tmpfs           5.0M  8.0K  5.0M   1% /run/lock
tmpfs           1.1G  184K  1.1G   1% /run/user/1000
douda@Douda:~$ du -sh
151M    .
douda@Douda:~$ free -h
               total        used        free      shared  buff/cache   available
Mem:            10Gi       2.4Gi       6.4Gi        62Mi       2.4Gi       8.5Gi
Swap:             0B          0B          0B
```


douda@Douda:~$ ps aux
USER PID %CPU %MEM VSZ RSS TTY STAT START TIME COMMAND
root 1 0.1 0.1 23248 14284 ? Ss 06:44 0:20 /sbin/init splash
root 2 0.0 0.0 0 0 ? S 06:44 0:00 [kthreadd]
root 3 0.0 0.0 0 0 ? S 06:44 0:00 [pool_workqueue_release]
root 4 0.0 0.0 0 0 ? I< 06:44 0:00 [kworker/R-rcu_g]
root 5 0.0 0.0 0 0 ? I< 06:44 0:00 [kworker/R-rcu_p]
root 6 0.0 0.0 0 0 ? I< 06:44 0:00 [kworker/R-slub_]
root 7 0.0 0.0 0 0 ? I< 06:44 0:00 [kworker/R-netns]
root 12 0.0 0.0 0 0 ? I< 06:44 0:00 [kworker/R-mm_pe]
root 13 0.0 0.0 0 0 ? I 06:44 0:00 [rcu_tasks_kthread]
root 14 0.0 0.0 0 0 ? I 06:44 0:00 [rcu_tasks_rude_kthread]
root 15 0.0 0.0 0 0 ? I 06:44 0:00 [rcu_tasks_trace_kthread]
root 16 0.0 0.0 0 0 ? S 06:44 0:14 [ksoftirqd/0]
root 17 0.1 0.0 0 0 ? I 06:44 0:31 [rcu_preempt]
root 18 0.0 0.0 0 0 ? S 06:44 0:01 [migration/0]
root 19 0.0 0.0 0 0 ? S 06:44 0:00 [idle_inject/0]
root 20 0.0 0.0 0 0 ? S 06:44 0:00 [cpuhp/0]
root 21 0.0 0.0 0 0 ? S 06:44 0:00 [cpuhp/1]
root 22 0.0 0.0 0 0 ? S 06:44 0:00 [idle_inject/1]
root 23 0.0 0.0 0 0 ? S 06:44 0:02 [migration/1]
douda@Douda:~$ lspci
00:00.0 Host bridge: Intel Corporation 440FX - 82441FX PMC [Natoma] (rev 02)
00:01.0 ISA bridge: Intel Corporation 82371SB PIIX3 ISA [Natoma/Triton II]
00:01.1 IDE interface: Intel Corporation 82371AB/EB/MB PIIX4 IDE (rev 01)
00:02.0 VGA compatible controller: VMware SVGA II Adapter
00:03.0 Ethernet controller: Intel Corporation 82540EM Gigabit Ethernet Controller (rev 02)
00:04.0 System peripheral: InnoTek Systemberatung GmbH VirtualBox Guest Service
00:05.0 Multimedia audio controller: Intel Corporation 82801AA AC'97 Audio Controller (rev 01)
00:06.0 USB controller: Apple Inc. KeyLargo/Intrepid USB
00:07.0 Bridge: Intel Corporation 82371AB/EB/MB PIIX4 ACPI (rev 08)
00:0b.0 USB controller: Intel Corporation 82801FB/FBM/FR/FW/FRW (ICH6 Family) USB2 EHCI Controller
00:0d.0 SATA controller: Intel Corporation 82801HM/HEM (ICH8M/ICH8M-E) SATA Controller [AHCI mode] (rev 02)
douda@Douda:~$ sudo apt install traceroute
[sudo] password for douda:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
traceroute
0 upgraded, 1 newly installed, 0 to remove and 218 not upgraded.
Need to get 60.5 kB of archives.
After this operation, 162 kB of additional disk space will be used.
Get:1 http://ht.archive.ubuntu.com/ubuntu noble/universe amd64 traceroute amd64 1:2.1.5-1 [60.5 kB]
Fetched 60.5 kB in 1s (108 kB/s)
Selecting previously unselected package traceroute.
(Reading database ... 149071 files and directories currently installed.)
Preparing to unpack .../traceroute_1%3a2.1.5-1_amd64.deb ...
Unpacking traceroute (1:2.1.5-1) ...
Setting up traceroute (1:2.1.5-1) ...
update-alternatives: using /usr/bin/traceroute.db to provide /usr/bin/traceroute (traceroute) in auto mode
update-alternatives: using /usr/bin/traceroute6.db to provide /usr/bin/traceroute6 (traceroute6) in auto mode
update-alternatives: using /usr/bin/lft.db to provide /usr/bin/lft (lft) in auto mode
update-alternatives: using /usr/bin/traceproto.db to provide /usr/bin/traceproto (traceproto) in auto mode
update-alternatives: using /usr/sbin/tcptraceroute.db to provide /usr/sbin/tcptraceroute (tcptraceroute) in auto mode
Processing triggers for man-db (2.12.0-4build2) ...
douda@Douda:~$ traceroute google.com
traceroute to google.com (142.250.217.238), 30 hops max, 60 byte packets
1 10.0.2.2 (10.0.2.2) 15.391 ms 14.007 ms 2.510 ms
2 * * *
3 * * *
4 * * *
5 * * *
6 * * *
7 * * *
8 * * *
9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *


You can paste the image from the clipboard.
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
douda@Douda:~$ netstat -tuln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address Foreign Address State
tcp 0 0 127.0.0.53:53 0.0.0.0:* LISTEN
tcp 0 0 127.0.0.1:631 0.0.0.0:* LISTEN
tcp 0 0 127.0.0.54:53 0.0.0.0:* LISTEN
tcp6 0 0 ::1:631 :::* LISTEN
udp 0 0 0.0.0.0:37946 0.0.0.0:*
udp 0 0 0.0.0.0:5353 0.0.0.0:*
udp 0 0 127.0.0.54:53 0.0.0.0:*
udp 0 0 127.0.0.53:53 0.0.0.0:*
udp6 0 0 :::5353 :::*
udp6 0 0 :::34734 :::*
douda@Douda:~$ ss -tuln
Netid State Recv-Q Send-Q Local Address:Port Peer Address:Port Process
udp UNCONN 0 0 0.0.0.0:37946 0.0.0.0:*
udp UNCONN 0 0 0.0.0.0:5353 0.0.0.0:*
udp UNCONN 0 0 127.0.0.54:53 0.0.0.0:*
udp UNCONN 0 0 127.0.0.53%lo:53 0.0.0.0:*
udp UNCONN 0 0 [::]:5353 [::]:*
udp UNCONN 0 0 [::]:34734 [::]:*
tcp LISTEN 0 4096 127.0.0.53%lo:53 0.0.0.0:*
tcp LISTEN 0 4096 127.0.0.1:631 0.0.0.0:*
tcp LISTEN 0 4096 127.0.0.54:53 0.0.0.0:*
tcp LISTEN 0 4096 [::1]:631 [::]:*
douda@Douda:~$ journalctl
Feb 05 21:24:11 Douda kernel: Linux version 6.8.0-52-generic (buildd@lcy02-amd64-046) (x86_64-linux-gnu-gcc-13 (Ubuntu
Feb 05 21:24:11 Douda kernel: Command line: BOOT_IMAGE=/boot/vmlinuz-6.8.0-52-generic root=UUID=ddafe2cc-b834-4265-8742
Feb 05 21:24:11 Douda kernel: KERNEL supported cpus:
Feb 05 21:24:11 Douda kernel: Intel GenuineIntel
Feb 05 21:24:11 Douda kernel: AMD AuthenticAMD
Feb 05 21:24:11 Douda kernel: Hygon HygonGenuine
Feb 05 21:24:11 Douda kernel: Centaur CentaurHauls
Feb 05 21:24:11 Douda kernel: zhaoxin Shanghai
Feb 05 21:24:11 Douda kernel: BIOS-provided physical RAM map:
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000009fbff] usable
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x000000000009fc00-0x000000000009ffff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000000f0000-0x00000000000fffff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x0000000000100000-0x00000000dffeffff] usable
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000dfff0000-0x00000000dfffffff] ACPI data
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000fec00000-0x00000000fec00fff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000fee00000-0x00000000fee00fff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000fffc0000-0x00000000ffffffff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x0000000100000000-0x00000002f07fffff] usable
Feb 05 21:24:11 Douda kernel: NX (Execute Disable) protection: active
Feb 05 21:24:11 Douda kernel: APIC: Static calls initialized
douda@Douda:~$ journalctl -f
Feb 06 12:26:58 Douda systemd[1]: Started packagekit.service - PackageKit Daemon.
Feb 06 12:27:01 Douda sudo[25874]: pam_unix(sudo:session): session closed for user root
Feb 06 12:29:11 Douda pkexec[26128]: pam_unix(polkit-1:session): session opened for user root(uid=0) by douda(uid=1000)
Feb 06 12:29:11 Douda pkexec[26128]: douda: Executing command [USER=root] [TTY=unknown] [CWD=/home/douda] [COMMAND=/usr/
lib/update-notifier/package-system-locked]
Feb 06 12:30:01 Douda CRON[26176]: pam_unix(cron:session): session opened for user root(uid=0) by root(uid=0)
Feb 06 12:30:01 Douda CRON[26177]: (root) CMD ([-x /etc/init.d/anacron] && if [! -d /run/systemd/system]; then /usr/
sbin/invoke-rc.d anacron start >/dev/null; fi)
Feb 06 12:30:01 Douda systemd[1]: Starting sysstat-collect.service - system activity accounting tool...
Feb 06 12:30:01 Douda CRON[26176]: pam_unix(cron:session): session closed for user root
Feb 06 12:30:01 Douda systemd[1]: sysstat-collect.service: Deactivated successfully.
Feb 06 12:30:01 Douda systemd[1]: Finished sysstat-collect.service - system activity accounting tool.
Feb 06 12:37:28 Douda systemd-resolved[369]: Clock change detected. Flushing caches.
douda@Douda:~$ journalctl -b
Feb 05 21:24:11 Douda kernel: Linux version 6.8.0-52-generic (buildd@lcy02-amd64-046) (x86_64-linux-gnu-gcc-13 (Ubuntu
Feb 05 21:24:11 Douda kernel: Command line: BOOT_IMAGE=/boot/vmlinuz-6.8.0-52-generic root=UUID=ddafe2cc-b834-4265-8742
Feb 05 21:24:11 Douda kernel: KERNEL supported cpus:
Feb 05 21:24:11 Douda kernel: Intel GenuineIntel
Feb 05 21:24:11 Douda kernel: AMD AuthenticAMD
Feb 05 21:24:11 Douda kernel: Hygon HygonGenuine
Feb 05 21:24:11 Douda kernel: Centaur CentaurHauls
Feb 05 21:24:11 Douda kernel: zhaoxin Shanghai
Feb 05 21:24:11 Douda kernel: BIOS-provided physical RAM map:
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x0000000000000000-0x000000000009fbff] usable
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x000000000009fc00-0x000000000009ffff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000000f0000-0x00000000000fffff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x0000000000100000-0x00000000dffeffff] usable
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000dfff0000-0x00000000dfffffff] ACPI data
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000fec00000-0x00000000fec00fff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000fee00000-0x00000000fee00fff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x00000000fffc0000-0x00000000ffffffff] reserved
Feb 05 21:24:11 Douda kernel: BIOS-e820: [mem 0x0000000100000000-0x00000002f07fffff] usable
Feb 05 21:24:11 Douda kernel: NX (Execute Disable) protection: active
Feb 05 21:24:11 Douda kernel: APIC: Static calls initialized
Feb 05 21:24:11 Douda kernel: SMBIOS 2.5 present.
Feb 05 21:24:11 Douda kernel: DMI: innotek GmbH VirtualBox/VirtualBox, BIOS VirtualBox 12/01/2006
Feb 05 21:24:11 Douda kernel: Hypervisor detected: KVM



Conclusion

À travers ce TD, j’ai exploré des compétences essentielles en scripting Bash, en gestion de bases de données, et en utilisation de commandes système. Je sais désormais :

- Créer des scripts interactifs pour des opérations mathématiques ou des comparaisons.
- Générer des graphiques avec gnuplot pour visualiser des données.
- Résoudre des équations mathématiques simples via l'automatisation.
- Structurer une base de données SQL pour stocker et gérer des informations.
- Utiliser des commandes système avancées pour analyser les ressources, les processus, et le réseau.