

# Template Week 5 – Operating Systems

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## Assignment 5.1: Unix-like

- a) Find out what the difference is between UNIX and unix-like operating systems?

UNIX is basically a proprietary operating system developed in the late 1970s by AT&T's Bell Laboratories mainly by Ken Thompson, Dennis Ritchie, and others. It is a multi-user, multitasking system designed to be portable, multitasking, and multiuser in a time-sharing configuration.

UNIX-like Operating Systems means operating systems that act similar-to UNIX but are not direct derivative of UNIX. Many of them are open sources, and they include Linux and BSD (Berkeley Software Distribution), macOS, etc. They would all subscribe to UNIX principles, philosophy, and having their implementations or functionalities different.

Main differences:

Commercial vs. Open source: UNIX is a commercial product; UNIX-like systems like Linux are found as open-source.

Licensing: UNIX subject to proprietary licenses; UNIX-like typically is licensed under GPL (General Public License) and BSD or some other open-source licenses.

- b) Study the image above named UNIX timeline. Find out who Ken Thompson, Dennis Ritchie, Bill Joy, Richard Stallman, and Linus Torvalds are and what they have contributed to the development of UNIX or unix-like systems and to IT in general. **TIP!** English-language sources often contain more detailed information about these individuals.

**Ken Thompson**- was among the initial architects of UNIX in 1969 at AT&T Bell Labs. He wrote the original version of UNIX along with Dennis Ritchie and others.

Impact- The development of UNIX with the help of Thompson laid the stone for future development of the UNIX operating system which inspired a lot of modern operating systems including Linux.

**Dennis Ritchie** co-developed UNIX with Ken Thompson at AT&T Bell Labs. He also has the distinction of being the one who invented the C programming language that was involved in creating UNIX.

Impact: The C-language became and still is the language with which almost all operating systems are written. UNIX was among the first major operating systems that had been written in C, which made it more portable and easier to modify.

**Bill Joy**- is one of the people that created the BSD (Berkeley Software Distribution)-a variant of UNIX developed at the University of California, Berkeley. He made the C shell (csh) and assisted in several innovations in the BSD family of UNIX.

Impact: Key features in BSD were TCP/IP networking stack and virtual memory. These were essential for the development of modern operating systems such as macOS and Linux.

**Richard Stallman** - was the one who created the Free Software Foundation (FSF) in 1985, and he started the GNU Project in 1983 which aimed to develop software that was free to all. The important project of GPL- GNU Public License was also part of the promotion of software freedom.

Impact: Many of the building blocks for UNIX-like systems, including compilers, text editors, and shells, were created by Stallman's GNU Project and were essential to the development of Linux and other free UNIX-like systems.

Linus Torvalds created the Linux kernel in 1991, which is the core of the Linux operating system. He released it as open source, allowing thousands of developers worldwide to contribute to its growth.

Impact: Torvalds' work on Linux has made it one of the most widely used UNIX-like operating systems in the world, powering everything from servers to smartphones and embedded systems.

- c) What is the philosophy of the GNU movement?

Richard Stallman founded the GNU (GNU is Not Unix) movement, which advocates creating and distributing free software for anyone to use, modify, and share. The main principles of freedom, collaborative development, and copyleft include:

Freedom: Users should have the liberty to run, modify, and share the software. The software should be free in both senses: free as in speech (freedom) and free as in beer (gratis).

Collaboration: The GNU philosophy encourages mutual collaboration between developers and users to improve software. The software should develop itself under open conditions in order for anyone to contribute.

Copyleft: this legal system maintains software free and open by requiring derivative works to be licensed under the same conditions as the original software. Its most famous usage is in the GPL (General Public License).

- d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement?

Please explain your answer.

Yes, Ubuntu as a Linux operating system largely conforms to the philosophy of the GNU movement. Ubuntu is based on the Linux kernel, which is open-source, and it incorporates many components of the GNU Project, including tools like the GNU C Compiler (GCC), the Bash shell, and core utilities. Ubuntu is released under free and open-source licenses, and its code can be freely used, modified, and distributed.

Ubuntu is built on the principles of free software and provides users with the freedom to use, share, and modify the operating system, consistent with the GNU movement's goals.

However, Ubuntu does include some proprietary software by default, such as certain multimedia codecs, proprietary drivers, and non-free applications (e.g., Adobe Flash, Skype). This inclusion of proprietary software may be seen as a departure from the strictest interpretation of the GNU movement's philosophy, which advocates for all software in a system to be free. Despite this, Ubuntu remains one of the most popular distributions that align closely with GNU principles.

- e) Find out what is the Windows Subsystem for Linux?

The Windows Subsystem for Linux (WSL) allows users to run a Linux environment directly on Windows without the need for a virtual machine. It enables the use of Linux command-line tools and applications alongside Windows. WSL 2, with a full Linux kernel, improves performance and compatibility with Linux software.

- f) Find out, which operating system family belongs to Android, iOS and ChromeOS?

Android is based on the Linux kernel, making it part of the Unix-like family, though it's modified for mobile devices. iOS, on the other hand, is Unix-like, based on Darwin, which originates from BSD. ChromeOS is also Linux-based and part of the Unix-like family, optimized for web applications on Chromebooks.

## Assignment 5.2: Supercomputers and gameconsoles

- a) Research on this site what supercomputers are used for and write a short summary of it:  
<https://www.computerhistory.org/timeline/search/?q=Supercomputer.>

Supercomputers are designed to handle extremely complex and data-intensive tasks that require vast computational power. They are used in fields such as scientific research, climate modelling, weather forecasting, aerospace engineering, medical research, and artificial intelligence. Their ability to process large volumes of data and perform high-speed calculations makes them essential for simulations, predictions, and solving problems that traditional computers cannot handle efficiently.

- b) IBM is a company that has already built several supercomputers. One of them is IBM's Roadrunner. The CPU developed for this supercomputer was further developed at a later stage as the CPU for the PlayStation 3 console. Find out what a **PlayStation 3 cluster** is and what it was used for?

A PlayStation 3 (PS3) cluster is a network of multiple PS3 consoles connected to function as a supercomputer. Utilizing the PS3's Cell Broadband Engine processor, these clusters were used for high-performance computing tasks like scientific simulations, climate modelling, and AI research. The PS3's parallel processing power allowed researchers to perform complex computations at a low cost compared to traditional supercomputers. While no longer widely used, PS3 clusters were a cost-effective solution for academic and scientific communities seeking affordable computational power.

- c) You can build a supercomputer by putting a few computers together in a cluster. Here's what Oracle did with a collection of Raspberry Pi's, for example:  
<https://blogs.oracle.com/developers/post/building-the-worlds-largest-raspberry-pi-cluster>  
What specific operating system is running on this cluster?

The Oracle Raspberry Pi cluster runs Oracle Linux as its operating system. Oracle Linux is a free, open-source distribution that is optimized for performance and security, making it suitable for building large-scale computing environments like this Raspberry Pi cluster. The cluster was designed to demonstrate Oracle's capabilities in handling workloads and to provide an environment for testing and development.

- d) Does Oracle's Raspberry Pi supercomputer appear in the list of the 500 fastest supercomputers in the world? Make a logical decision for this, without going through the entire list Oracle's Raspberry Pi supercomputer does **not** appear in the **Top 500 list of the fastest supercomputers**.  
<https://www.top500.org/lists/top500/list/2023/06/>

The Raspberry Pi cluster, while impressive in scale and as a demonstration of distributed computing, is not designed for the massive computational power required by the supercomputers on the list. The Top 500 features systems capable of performing at least in the teraflop range, with many reaching into petaflops or exaflops. These machines typically rely on specialized hardware like NVIDIA GPUs or IBM processors. In contrast, the Raspberry Pi cluster is based on low-cost, low-power single-board computers that do not meet the computational demands required to make it onto the Top 500 list. Thus, while the Oracle Raspberry Pi cluster is

a significant achievement in terms of low-cost, educational, or experimental computing, its performance is far below what is needed for inclusion among the world's fastest supercomputers.

- e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?

What operating systems run on these consoles?

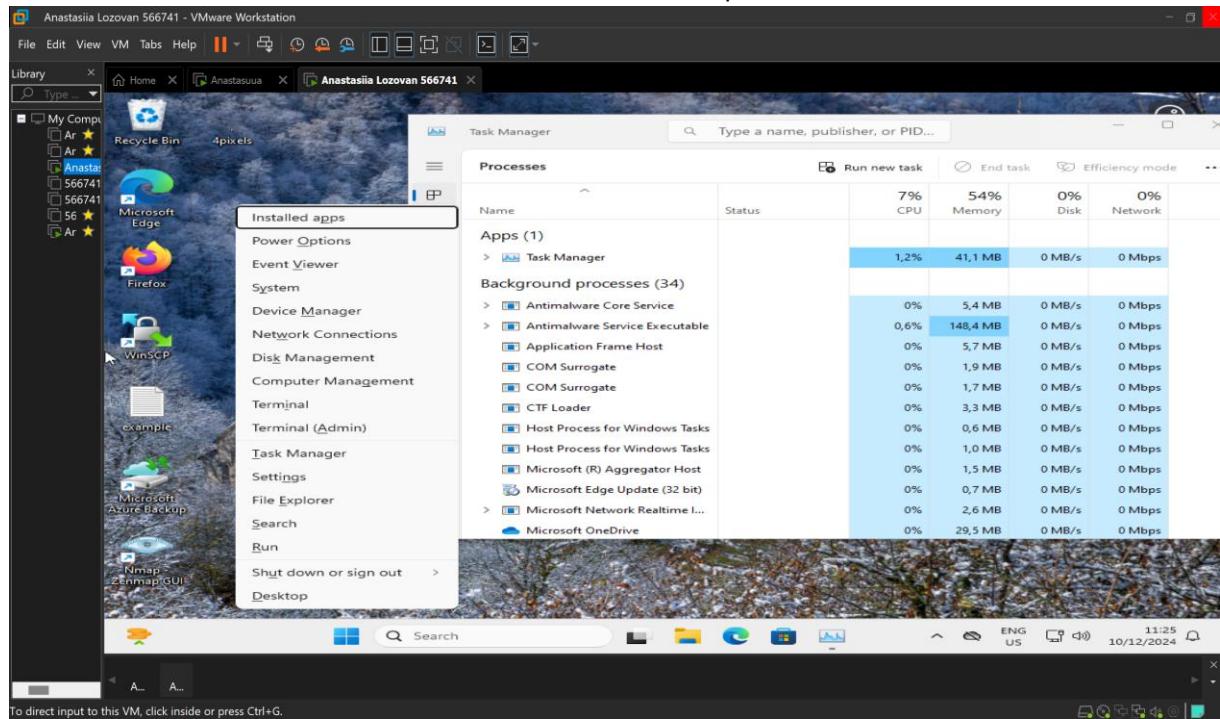
What conclusion can you draw from the answer to the previous question?

Both the PlayStation 5 and Xbox Series X use AMD Ryzen Zen 2 processors based on the x86-64 architecture, which is commonly used in modern PCs. The PlayStation 5 runs a custom operating system based on FreeBSD, a Unix-like system tailored for gaming, while the Xbox Series X uses a version of Windows 10 optimized for gaming with a modified Windows Kernel. This shared architecture and operating system foundation highlight the growing convergence between gaming consoles and PCs, as both platforms now utilize similar hardware and software, making them capable of handling tasks beyond gaming.

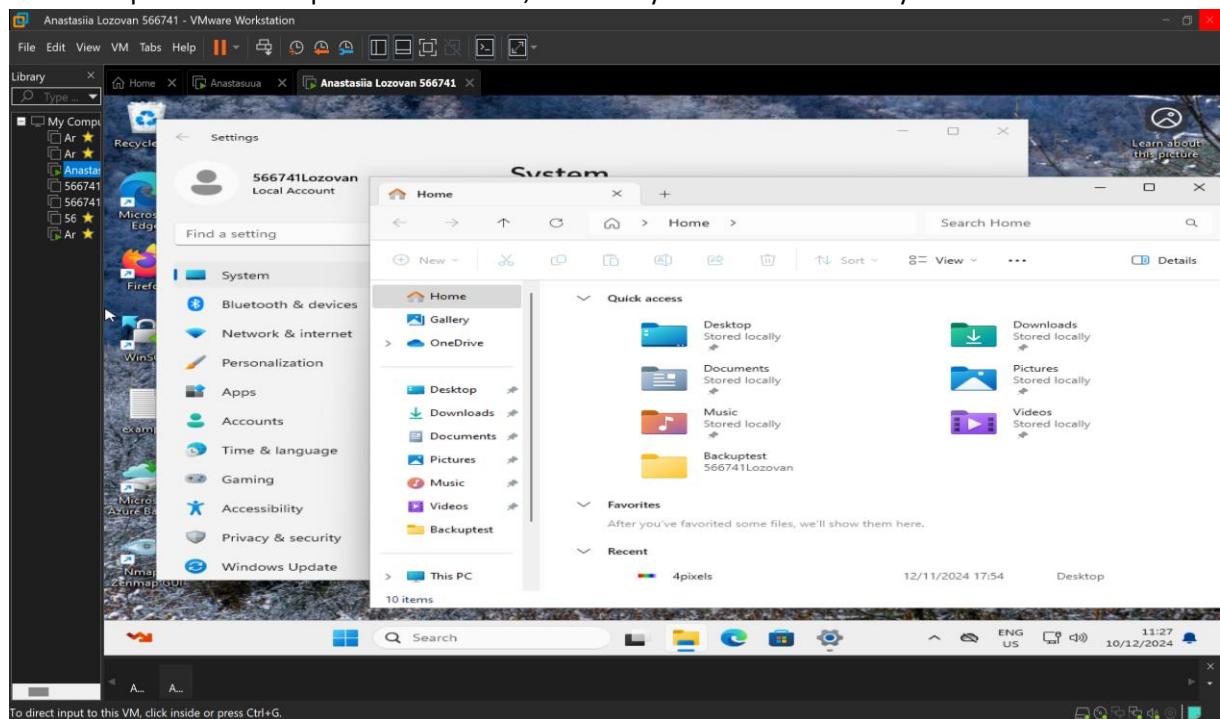
## Assignment 5.3: Working with Windows

Take relevant screenshots of the assignments below

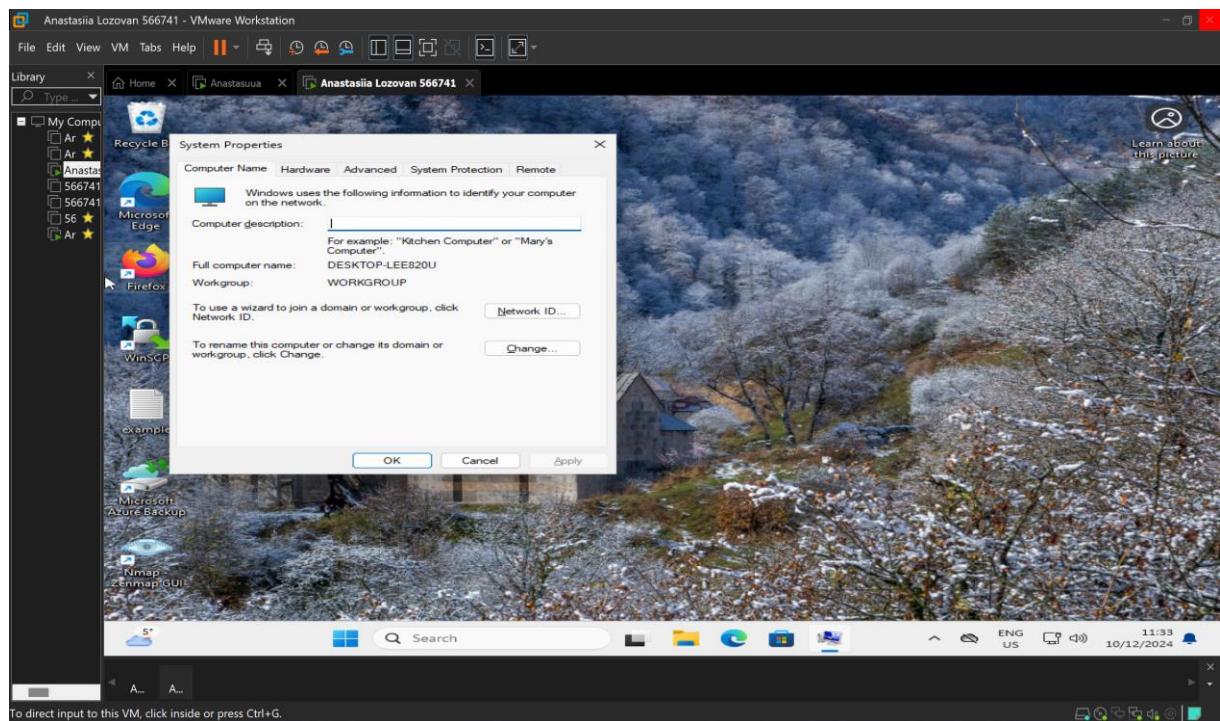
- a) Practice for about 10 minutes with the **Windows** keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.



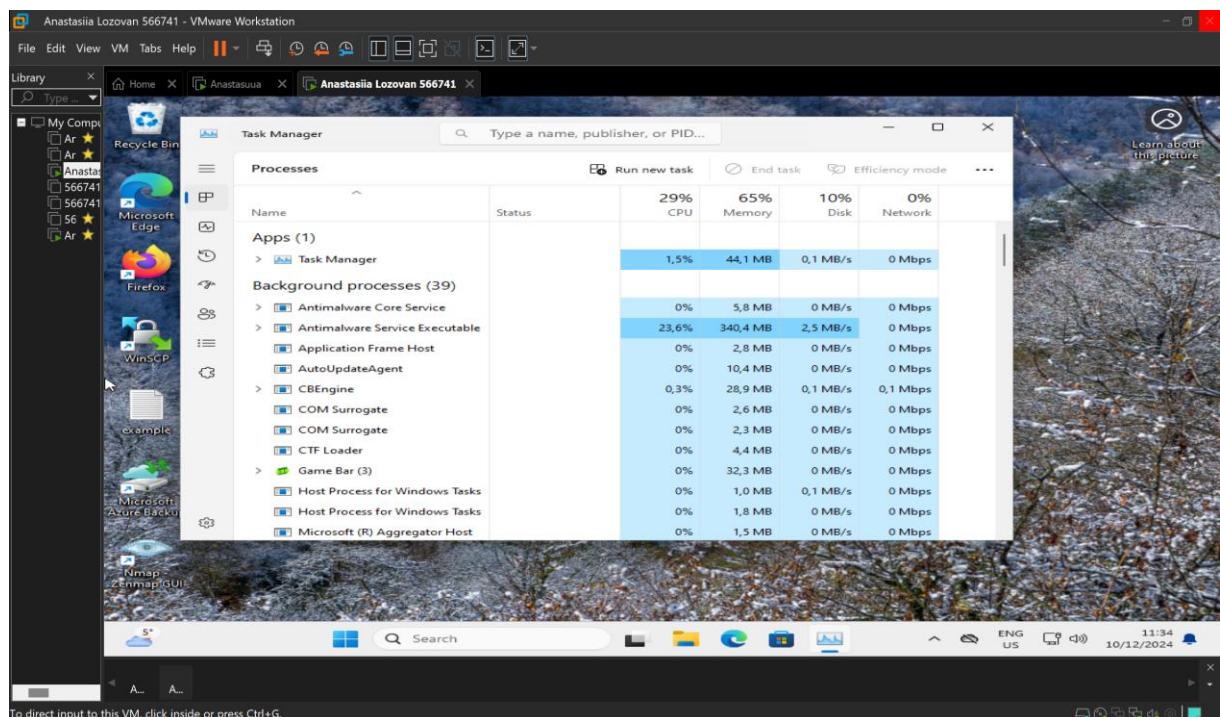
- b) The file explorer can be opened with **Windows + E**, Which key combination could you also use?

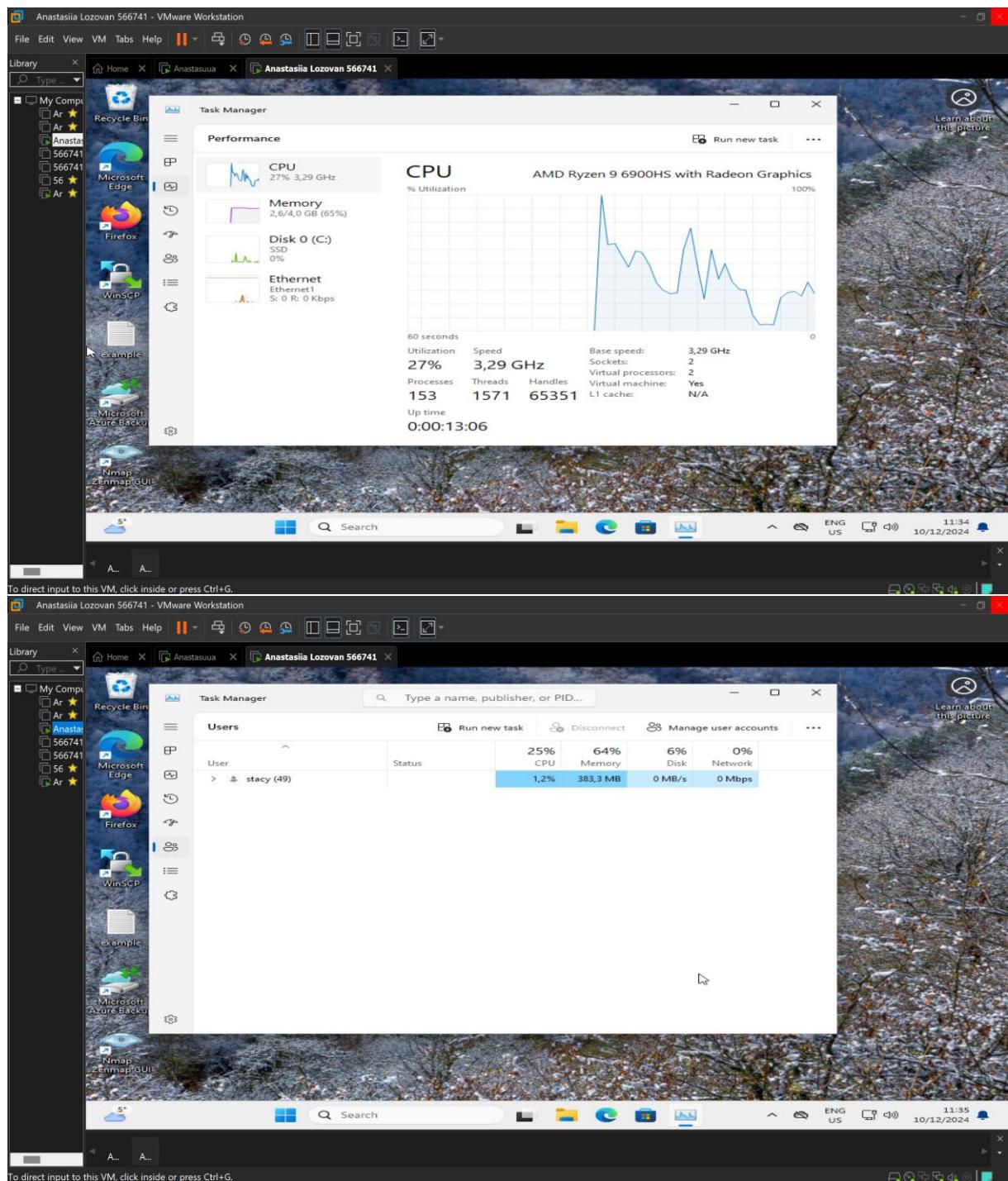


- c) Open the system properties with a **Windows** key combination, take a screenshot of the open screen. Paste this screenshot into this template.



- d) Open task manager with a key combination. Take screenshots of the tabs: processes (shows active processes), performance, and users. Place these three screenshots in this template.



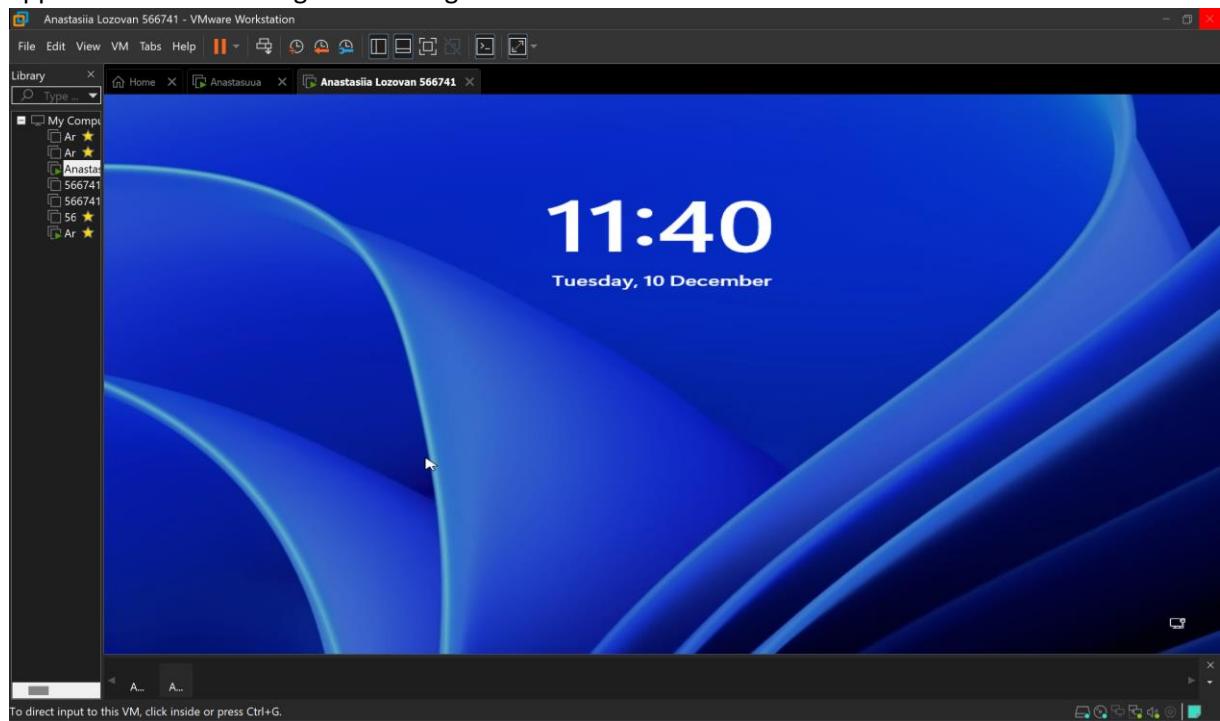


- e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector, or the second screen. Which key combination should you use for this?

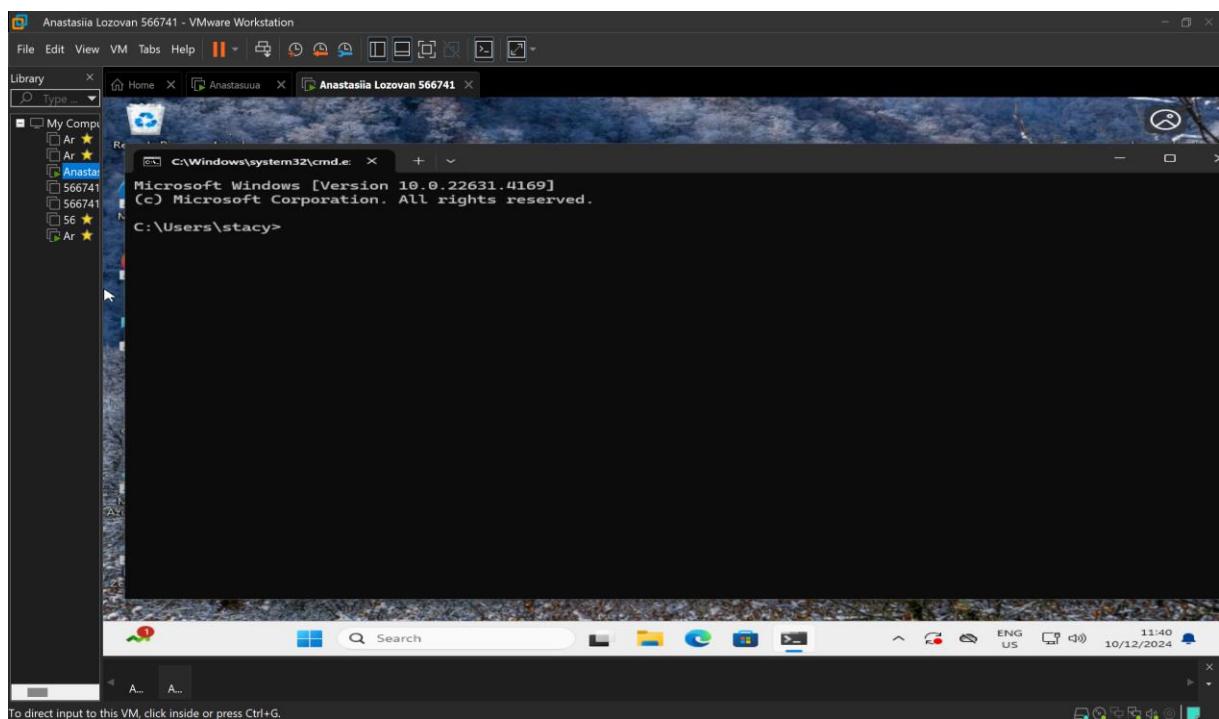
When I use the projector as a second screen during a PowerPoint presentation, I press **Windows + P** to open the display options. From there, I choose **Extend**, which allows you to show presentations on the projector while keeping other applications (like Outlook) open on laptop screen.

- f) If you leave the classroom for a while and you leave your laptop behind, it is wise to lock the screen. Your Apps will continue to run in the background. So, for example, if you're waiting for a download that takes a while, lock the screen and get a cup of coffee. Which key combination do you use for this?

To lock your screen in Windows, press **Windows + L**. This will secure your laptop while allowing apps to continue running in the background.

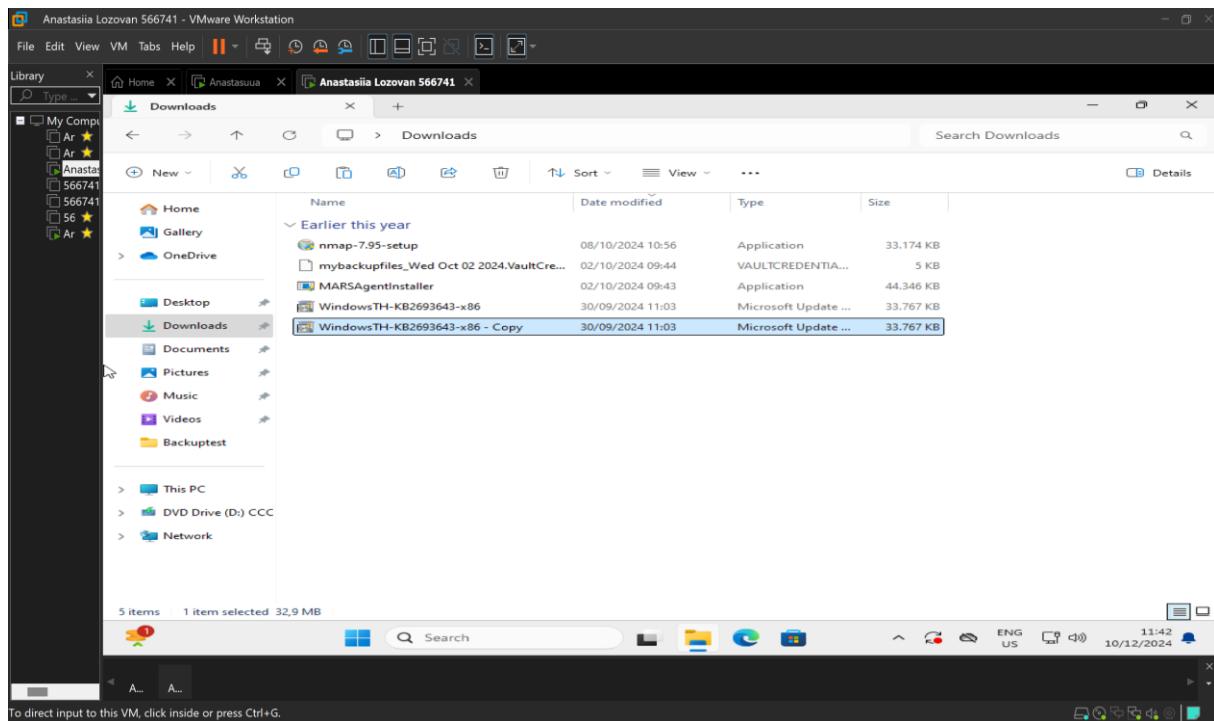


- g) Open the Run screen with a key combination. On this screen, type CMD and press <enter>. Take a screenshot of this result and paste it into this template.

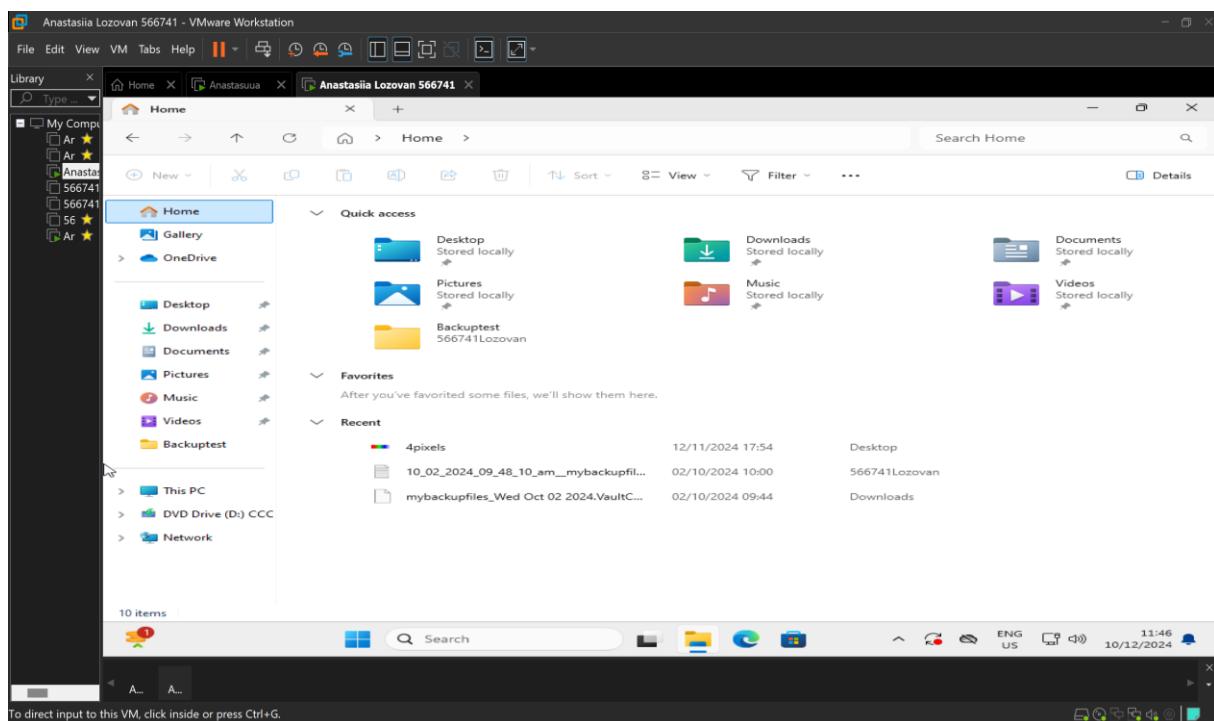


## Working in the File Explorer

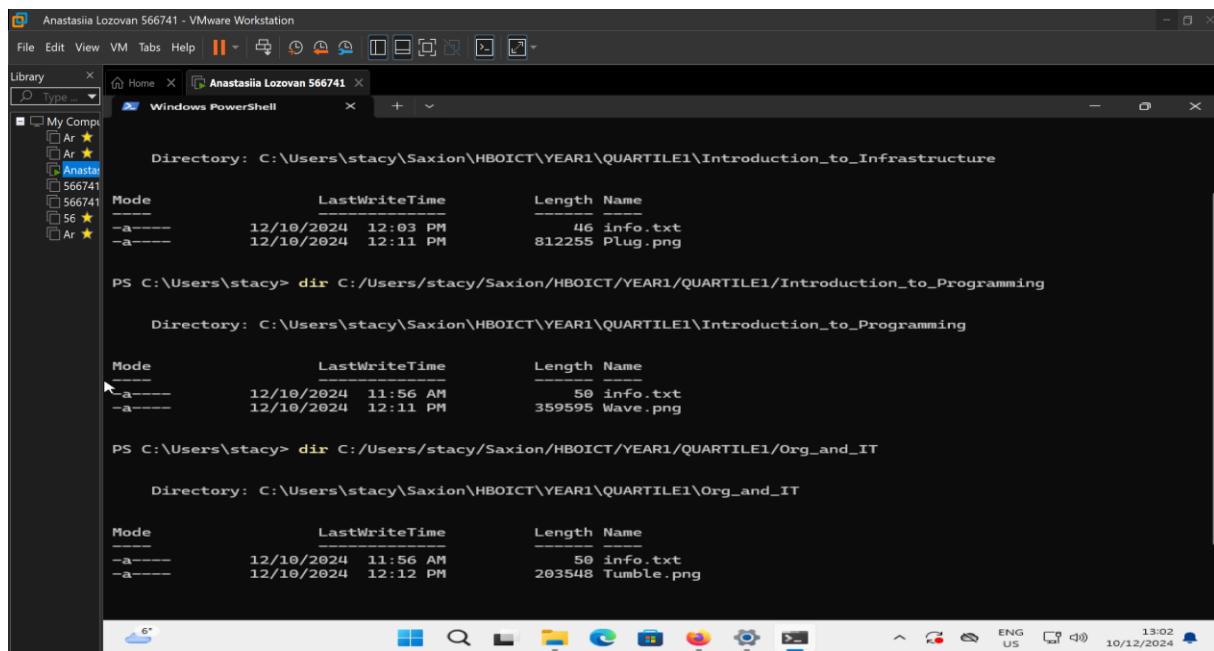
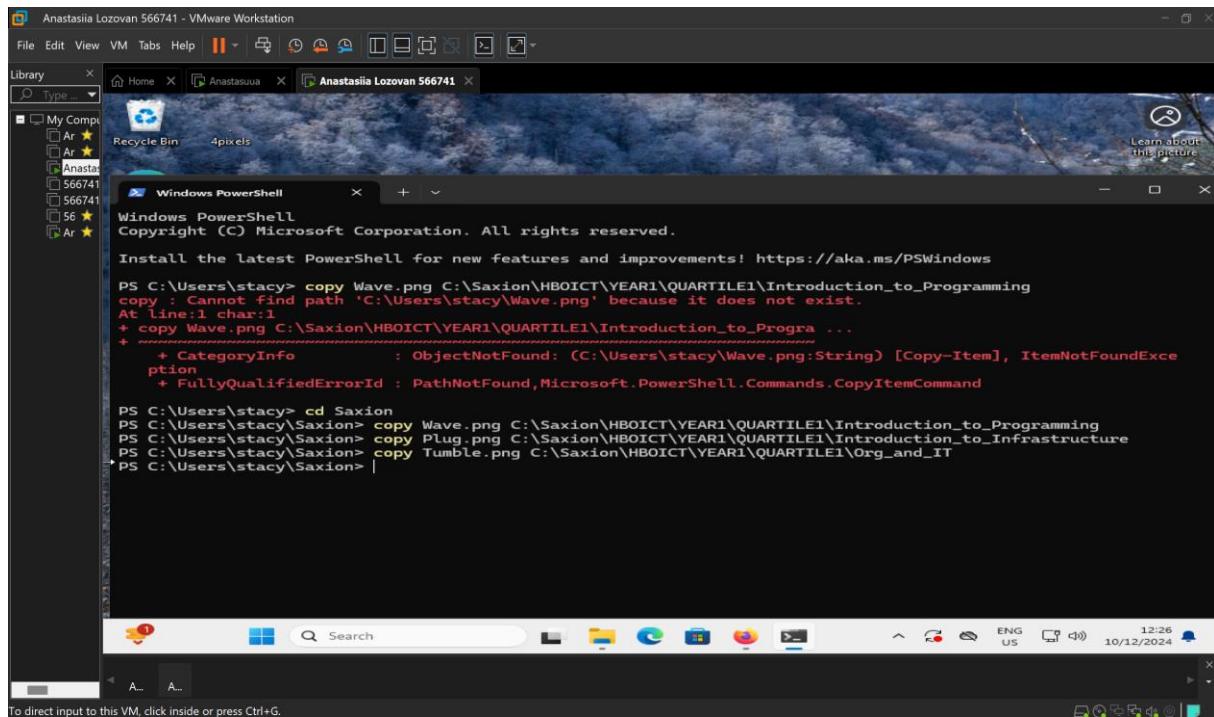
Relevant screenshots **copy** command:



Relevant screenshots **tree** command:

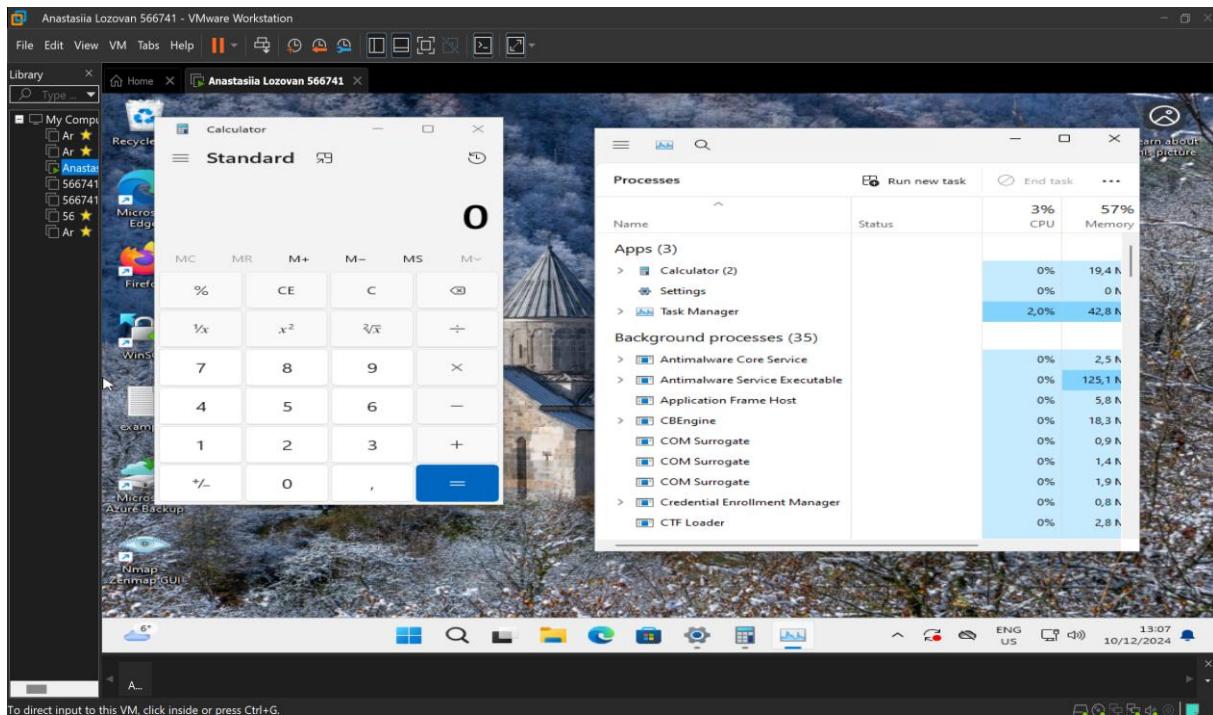


Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.



## Terminating Processes

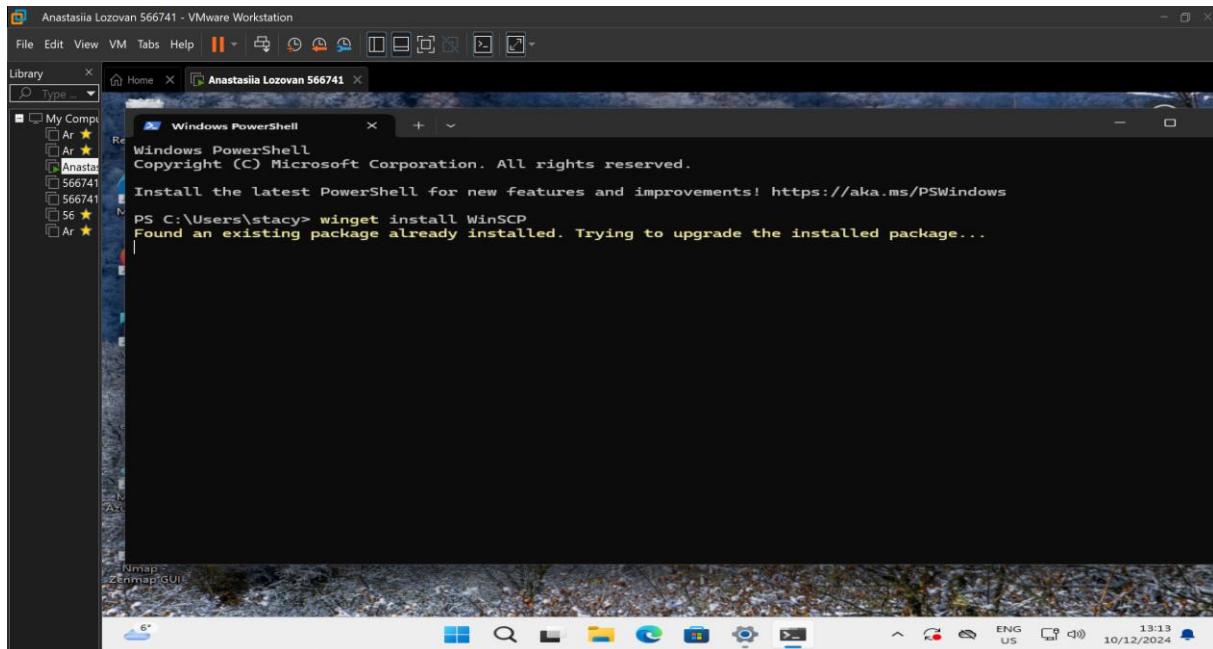
Relevant Screenshots Task Manager Window:



## Install Software

Relevant screenshots that the following software is installed:

- WinSCP
- Notepad++
- 7zip



```

Anastasia Lozovan 566741 - VMware Workstation
File Edit View VM Tabs Help ||| Type ... Library Home Anastasia Lozovan 566741

Windows PowerShell
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://sourceforge.net/projects/winscp/files/WinSCP/6.3.6/WinSCP-6.3.6-Setup.exe/download 11.0 MB / 11.0 MB
Successfully verified installer hash
Starting package install...
Successfully installed
PS C:\Users\stacy> winget install Notepad++.Notepad++
Found an existing package already installed. Trying to upgrade the installed package...
Found Notepad++ [Notepad++.Notepad++] Version 8.7.4
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://github.com/notepad-plus-plus/notepad-plus-plus/releases/download/v8.7.4/npp.8.7.4.Installer.x64.exe 6.34 MB / 6.34 MB
Successfully verified installer hash
Starting package install...
The installer will request to run as administrator, expect a prompt.
Successfully installed
PS C:\Users\stacy> winget install 7zip.7zip
Found an existing package already installed. Trying to upgrade the installed package...
Found 7-Zip [7zip.7zip] Version 24.09
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://7-zip.org/a/7z2409-x64.exe 1.56 MB / 1.56 MB
Successfully verified installer hash
Starting package install...
The installer will request to run as administrator, expect a prompt.

Nmap Zenmap GUI
6*
ENG US 13:15 10/12/2024

Anastasia Lozovan 566741 - VMware Workstation
File Edit View VM Tabs Help ||| Type ... Library Home Anastasia Lozovan 566741

Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

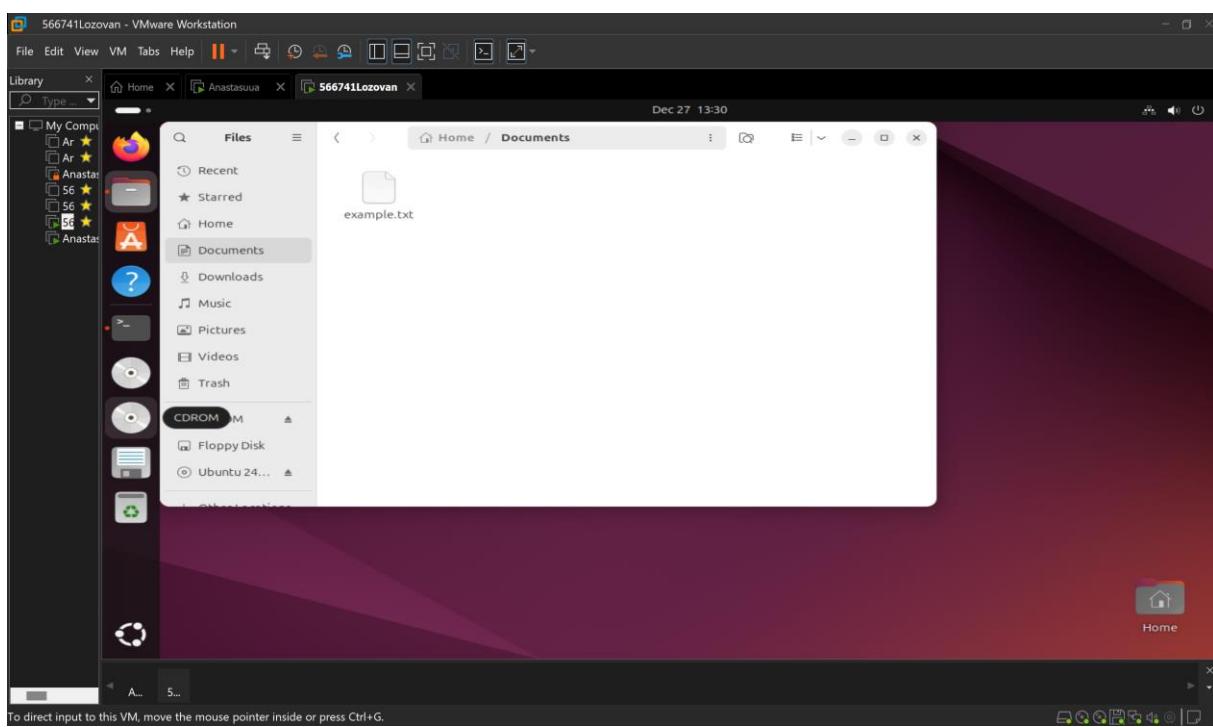
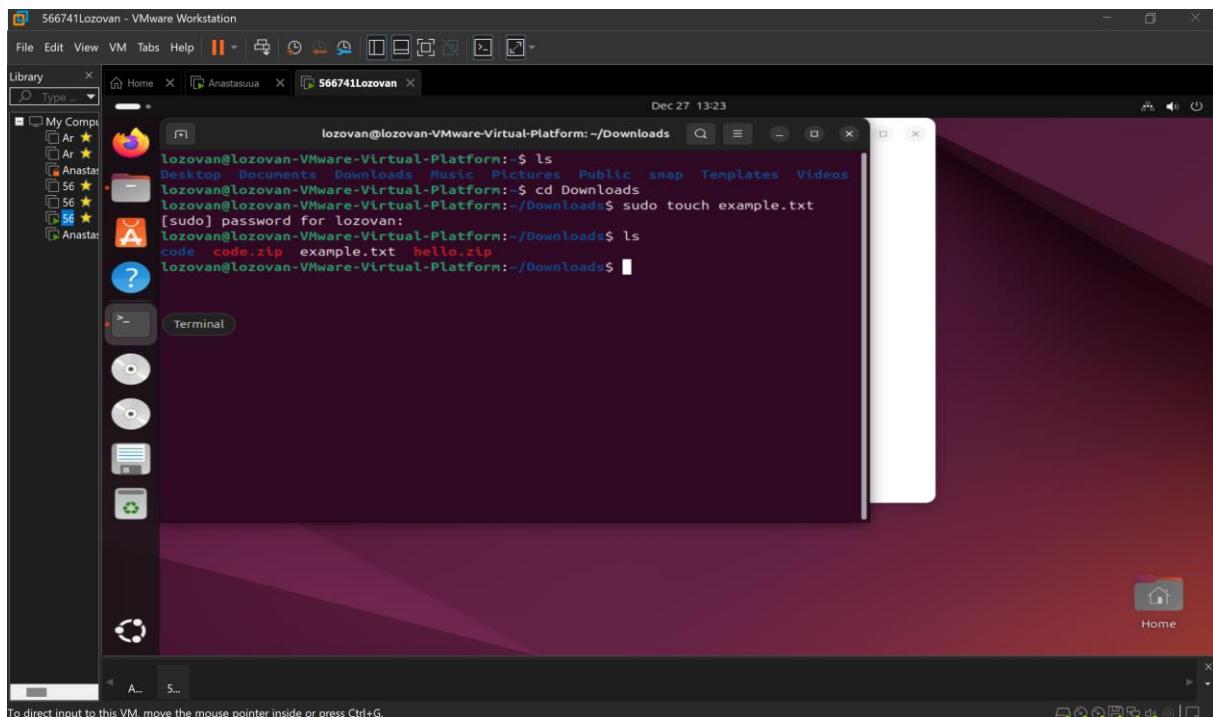
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows
PS C:\Users\stacy> winget install WinSCP
Found an existing package already installed. Trying to upgrade the installed package...
Found WinSCP [WinSCP.WinSCP] Version 6.3.6
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://sourceforge.net/projects/winscp/files/WinSCP/6.3.6/WinSCP-6.3.6-Setup.exe/download 11.0 MB / 11.0 MB
Successfully verified installer hash
Starting package install...
Successfully installed
PS C:\Users\stacy> winget install Notepad++.Notepad++
Found an existing package already installed. Trying to upgrade the installed package...
Found Notepad++ [Notepad++.Notepad++] Version 8.7.4
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://github.com/notepad-plus-plus/notepad-plus-plus/releases/download/v8.7.4/npp.8.7.4.Installer.x64.exe 6.34 MB / 6.34 MB
Successfully verified installer hash
Starting package install...
The installer will request to run as administrator, expect a prompt.

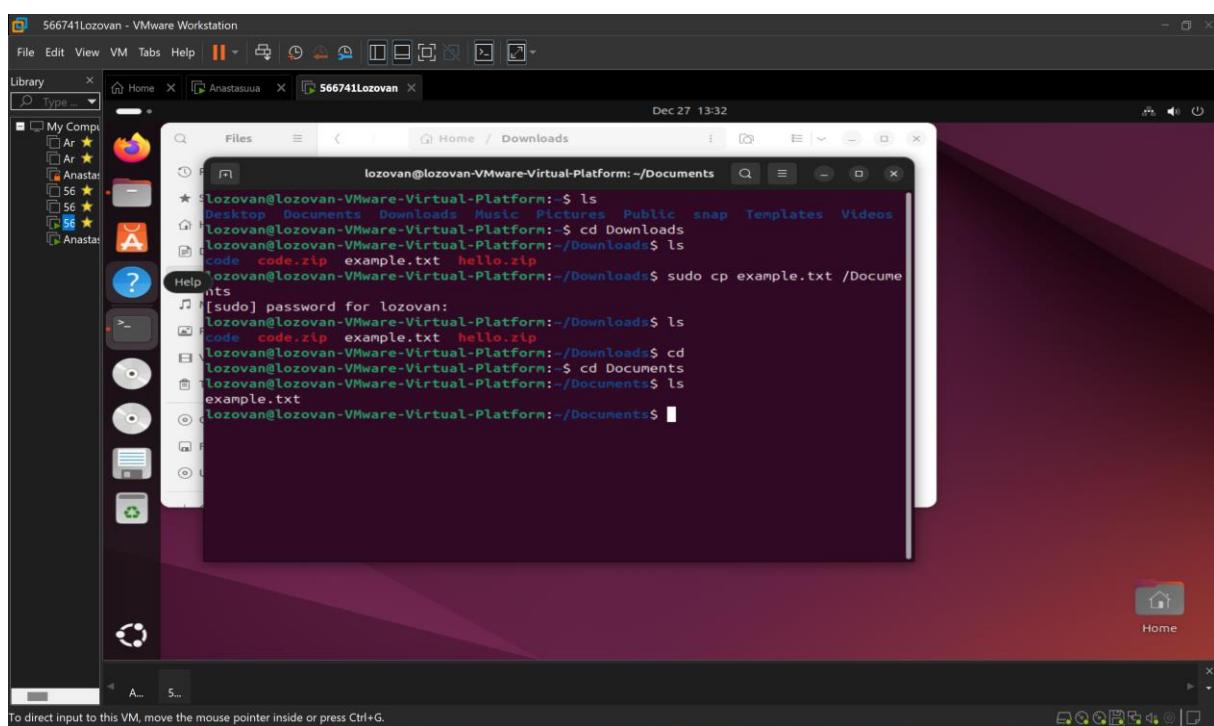
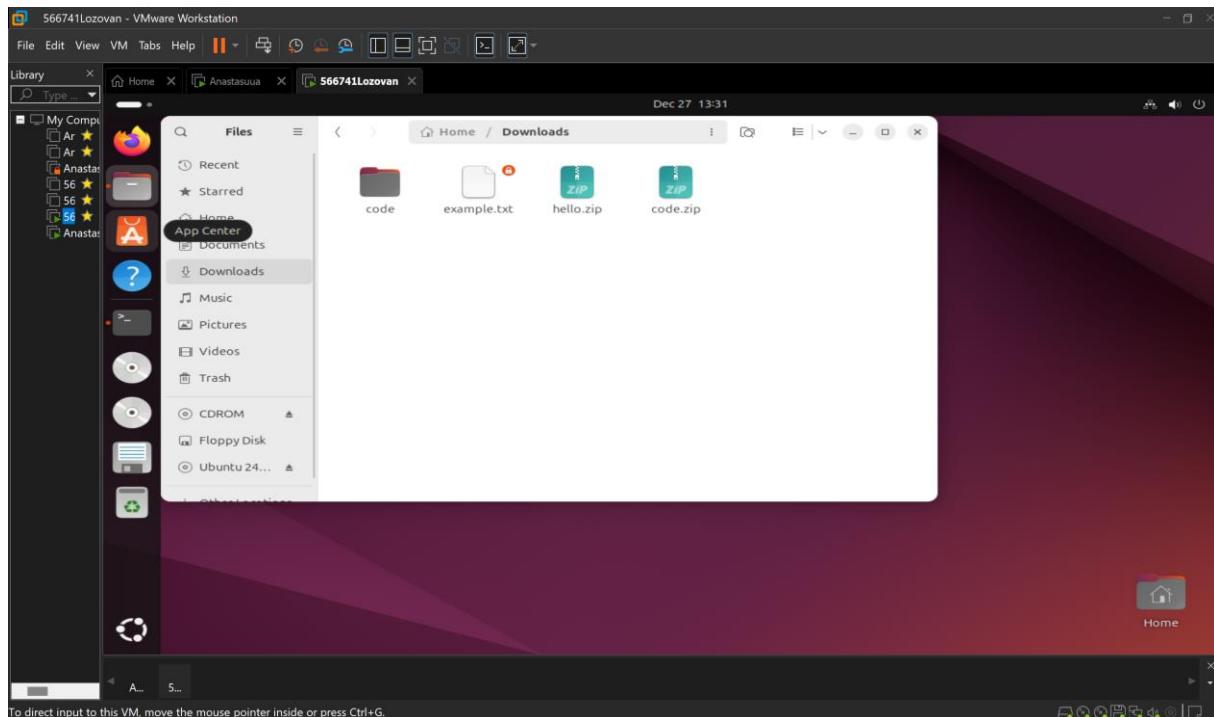
Nmap Zenmap GUI
6*
ENG US 13:14 10/12/2024

```

## Assignment 5.4: Working with Linux

Relevant screenshots + motivation





The screenshot shows a Linux desktop environment within a VMware Workstation window. A terminal window is open, displaying a command-line session. The user has navigated to their home directory (~) and then to the Downloads folder. They have listed files in Downloads and then changed to the Documents folder. In the terminal, they run the 'ls' command again, showing the contents of the Documents folder. Finally, they change to the /etc directory and list its contents. The terminal window title is 'lozovan@lozovan-VMware-Virtual-Platform: ~\$'. The desktop background is a purple gradient.

```
[sudo] password for lozovan:  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$ ls  
code code.zip example.txt hello.zip  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$ cd  
[lozovan@lozovan-VMware-Virtual-Platform: ~/Documents]$ ls  
example.txt  
[lozovan@lozovan-VMware-Virtual-Platform: ~/Documents]$ cd  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$ /etc  
bash: /etc: Is a directory  
Ubuntu 24.04.1 LTS amd64 - VMware-Virtual-Platform: $ cd /  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$ ls  
bin etc media sbin tmp  
bin usr-is-merged home mnt sbin usr-is-merged usr  
boot lib opt snap var  
cdrom lib64 proc srv  
dev lib usr-is-merged root swap.img  
Documents lost+found run sys  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$ /etc  
bash: /etc: Is a directory  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$ cd /  
[lozovan@lozovan-VMware-Virtual-Platform: ~]$
```

To return to your home folder in the terminal, use the command `cd ~` or simply `cd`. A significant difference between Linux and Windows file structures is that Linux uses a single-rooted directory structure (/), whereas Windows uses multiple drive letters like C:\ and D:\. The /etc directory in Linux is primarily used for storing system configuration files and settings.

The screenshot shows a Linux desktop environment within a VMware Workstation window. A terminal window is open, displaying a command-line session. The user attempts to run the 'tar' command to create a tar archive named 'example.tar' from the 'example.txt' file. However, they receive an error message stating 'tar: example.txt: Cannot stat: No such file or directory'. They then try running the command again with sudo privileges, but receive another error message stating 'tar: example.txt: Cannot stat: No such file or directory'. Finally, they navigate to the Downloads folder and run the command again with sudo privileges, successfully creating the 'example.tar' file. The terminal window title is 'lozovan@lozovan-VMware-Virtual-Platform: ~\$'. The desktop background is a purple gradient.

```
lozovan@lozovan-VMware-Virtual-Platform: ~$ tar -cvf example.tar example.txt  
tar: example.txt: Cannot stat: No such file or directory  
tar: Exiting with failure status due to previous errors  
lozovan@lozovan-VMware-Virtual-Platform: ~$ sudo tar -cvf example.tar example.txt  
[sudo] password for lozovan:  
tar: example.txt: Cannot stat: No such file or directory  
tar: Exiting with failure status due to previous errors  
lozovan@lozovan-VMware-Virtual-Platform: ~$ cd Downloads  
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ sudo tar -cvf example.tar example.txt  
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ ls  
code code.zip example.tar example.txt hello.zip  
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$
```

```

566741Lozovan - VMware Workstation
File Edit View VM Tabs Help || Library Home Anastasius 56741Lozovan Dec 27 13:36
tar: example.txt: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
lozovan@lozovan-VMware-Virtual-Platform:~$ sudo tar -cvf example.tar example.txt
[sudo] password for lozovan:
tar: example.txt: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
lozovan@lozovan-VMware-Virtual-Platform:~$ cd Downloads
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ sudo tar -cvf example.tar example.txt
example.txt
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ ls
code code.zip example.tar example.txt hello.zip
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ tar -xvf example.tar
example.txt
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ 
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ gzip example.tar
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ 
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ rm example.txt
lozovan@lozovan-VMware-Virtual-Platform:~/Downloads$ 

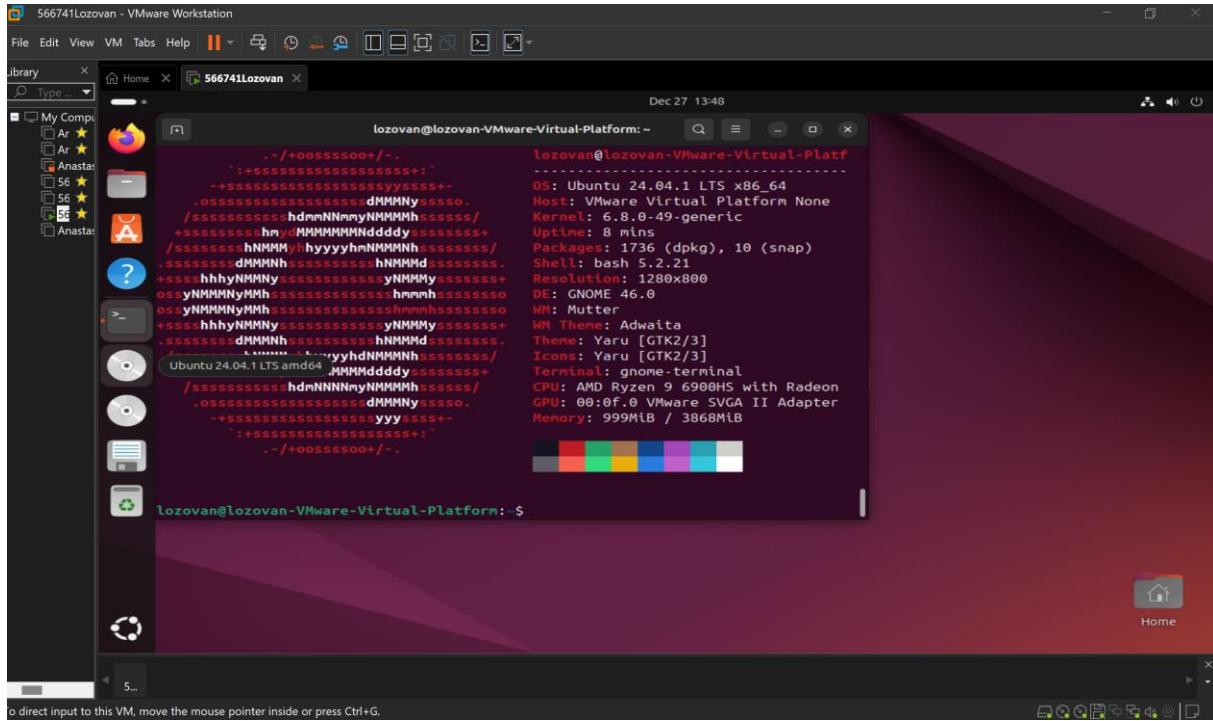
```

```

566741Lozovan - VMware Workstation
File Edit View VM Tabs Help || Library Home 56741Lozovan Dec 27 13:47
lozovan@lozovan-VMware-Virtual-Platform:~$ top
Tasks: 116, 359 thr, 196 kthr; 2 runn
1[1.3%]
Now[1.3%] Load average: 0.05 0.20 0.14
937M/3.78G Uptime: 00:06:42
Swp[0K/3.68G]

Main I/O
PID USER PRI NI VIRT RES SHR S CPU%MEM% TIME+ Command
3629 lozovan 20 0 19976 4864 3584 R 2.6 0.1 0:00.25 htop
2399 lozovan 20 0 3718M 265M 118M S 1.3 6.9 0:06.06 /usr/bin/gnom
1 root 20 0 23204 14144 9408 S 0.0 0.4 0:02.24 /sbin/init sp
372 root 19 -1 50836 17664 16256 S 0.0 0.4 0:00.38 /usr/lib/syst
409 root 20 0 148M 1548 1280 S 0.0 0.0 0:00.00 vmware-vmbloc
410 root 20 0 148M 1548 1280 S 0.0 0.0 0:00.00 vmware-vmbloc
411 root 20 0 148M 1548 1280 S 0.0 0.0 0:00.00 vmware-vmbloc
455 root 20 0 32848 11000 4984 S 0.0 0.3 0:00.28 /usr/lib/syst
systemd-oo 20 0 17556 7552 6656 S 0.0 0.2 0:00.15 /usr/lib/syst
CDROM systemd-re 20 0 22240 12696 18752 S 0.0 0.3 0:00.18 /usr/lib/syst
543 systemd-ti 20 0 91044 7808 6912 S 0.0 0.2 0:00.04 /usr/lib/syst
697 root 20 0 64732 11904 18368 S 0.0 0.3 0:00.03 /usr/bin/VGAu
709 root 20 0 247M 9344 7936 S 0.0 0.2 0:00.60 /usr/bin/vmto
789 systemd-ti 20 0 91044 7808 6912 S 0.0 0.2 0:00.00 /usr/lib/syst
797 root 20 0 247M 9344 7936 S 0.0 0.2 0:00.00 /usr/bin/vmto
F1 Help F2 Setup F3 Search F4 Filter F5 Tree F6 SortBy F7 Nice F8 Nice F9 Kill F10 quit

```



To compress a text file into a tar archive, use the command `tar -cvf archive_name.tar file_name.txt`.

To extract a tar file, use the command `tar -xvf archive_name.tar`. To compress a text file into a tar archive and then compress it with gzip, use `tar -czvf archive_name.tar.gz file_name.txt`.

To view processes, install htop with `sudo apt install htop` and launch it using htop. The application shows an interactive, real-time view of running processes, including CPU, memory usage, and process details.

To install software, use the Software Center in Ubuntu to find and install Sublime Text. To install the neofetch application via the terminal, use `sudo apt install neofetch`. When launched with neofetch, it displays system information such as the OS, kernel, CPU, memory, and an ASCII logo of the distribution.

### Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "566741Lozovan - VMware Workstation". The terminal content shows the following commands and their output:

```
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ ./hello.sh
bash: ./hello.sh: No such file or directory
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ ./hello.sh: line 3: Your: No such file or directory
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ chmod +x hello.sh
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ ls -l hello.sh
-rwxrwxr-x 1 lozovan lozovan 57 Dec 27 13:56 hello.sh
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ chmod 744 hello.sh
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ ls -l hello.sh
-rwxr--r-- 1 lozovan lozovan 57 Dec 27 13:56 hello.sh
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ ./hello.sh
./hello.sh: line 3: Your: No such file or directory
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ nano hello.sh
lozovan@lozovan-VMware-Virtual-Platform:~/hello$ ./hello.sh
Hello Anastasia Lozovan,566741!
lozovan@lozovan-VMware-Virtual-Platform:~/hello$
```

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "566741Lozovan - VMware Workstation". The terminal content shows the following commands and their output:

```
GNU nano 7.2          hello.sh *
#!/bin/bash

echo "Hello Anastasia Lozovan,566741!"
```

### Assignment 5.6: View the contents of files

Relevant screenshots + motivation

```
lozovan@lozovan-VMware-Virtual-Platform:~$ curl -O http://www.gutenberg.org/cache/epub/1/pg1.html
Resolving www.gutenberg.org (www.gutenberg.org)... 152.19.134.47, 2610:28:3090:3
000:0:bad:cafe:47
Connecting to www.gutenberg.org (www.gutenberg.org)|152.19.134.47|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 607504 (593K) [text/plain]
Saving to: '/home/lozovan/SherlockHolmes.txt'

/home/lozovan/Sherl 100%[=====] 593.27K  964KB/s   in 0.6s

2024-12-27 14:02:23 (964 KB/s) - '/home/lozovan/SherlockHolmes.txt' saved [607504/607504]

lozovan@lozovan-VMware-Virtual-Platform:~$ cd ~
lozovan@lozovan-VMware-Virtual-Platform:~$ wc SherlockHolmes.txt
12306 107562 607504 SherlockHolmes.txt
lozovan@lozovan-VMware-Virtual-Platform:~$ grep -n "kingdom" SherlockHolmes.txt
Floppy Disk
    "I tell you that I would give one of the provinces of my kingdom to
1124:And that was how a great scandal threatened to affect the kingdom of
lozovan@lozovan-VMware-Virtual-Platform:~$ lozovan@lozovan-VMware-Virtual-Platform:~$
```

```
lozovan@lozovan-VMware-Virtual-Platform:~$ "I tell you that I would give one of the provinces of my kingdom to
have that photograph."
"And for present expenses?"
The King took a heavy chamois leather bag from under his cloak and laid
it on the table.
"There are three hundred pounds in gold and seven hundred in notes," he
said.
Holmes scribbled a receipt upon a sheet of his note-book and handed it
to him.
"And Mademoiselle's address?" he asked.
"CDROM
Holmes took a note of it. "One other question," said he. "Was the
photograph a cabinet?"
"It was."
:
```

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "S66741Lozovan - VMware Workstation". The terminal content shows the user running the command "grep -n \"kingdom\" SherlockHolmes.txt" which finds several matches, and then using "less" to view the file. The user then runs "head -n 520 SherlockHolmes.txt | tail -n 40" to view the context around the word "kingdom". The desktop background is a purple gradient, and the taskbar at the bottom shows icons for Home, Applications, and other desktop environment components.

To analyze the `SherlockHolmes.txt` file, I first downloaded it using wget with the command: `wget https://www.gutenberg.org/files/1661/1661-0.txt -O SherlockHolmes.txt`

To count the lines, words, and characters in the file, I used: `wc SherlockHolmes.txt`

To find the lines containing the word "kingdom," I used grep with the -n option to display line numbers: `grep -n "kingdom" SherlockHolmes.txt`

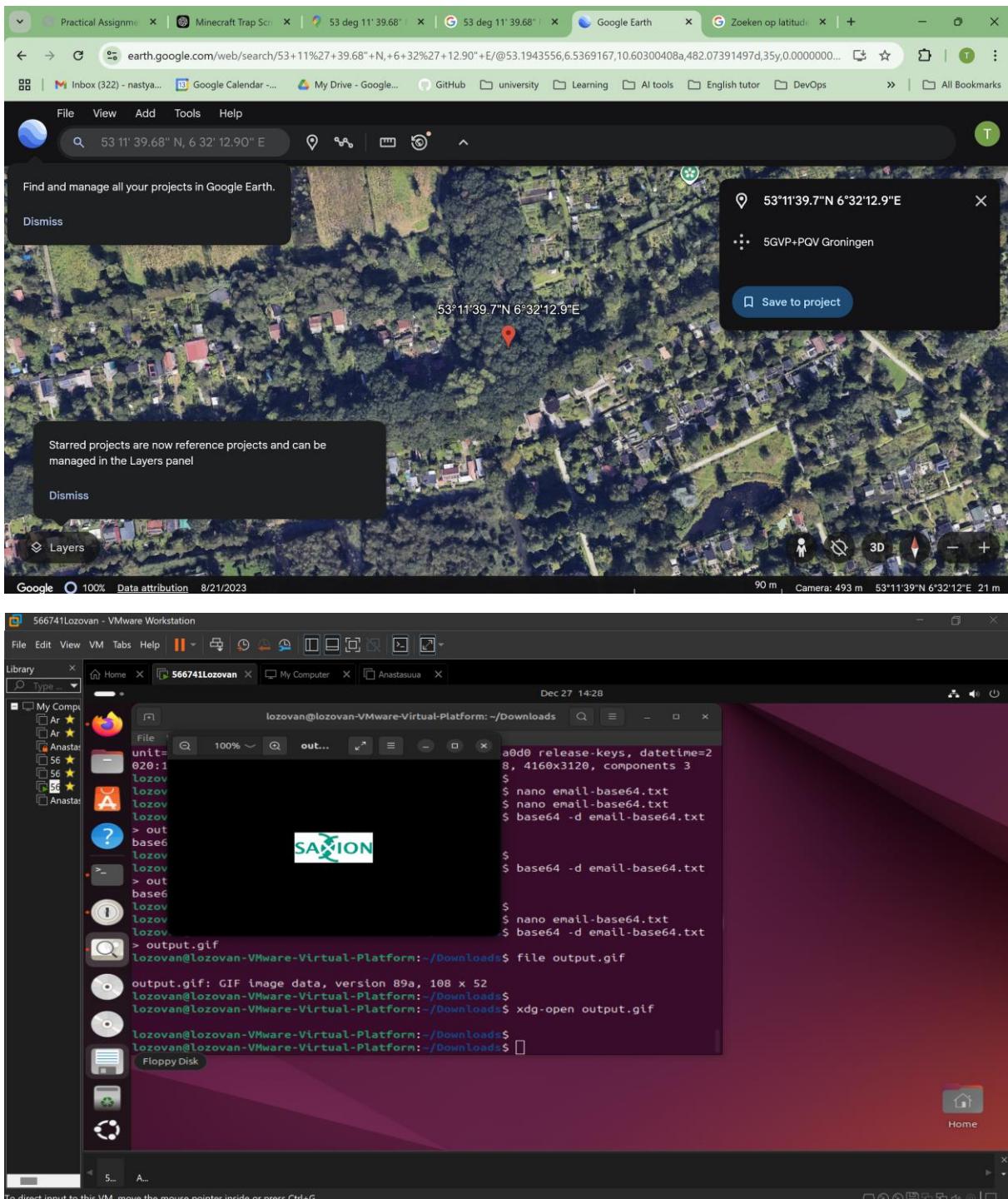
Finally, to view the 20 words before and after "kingdom," I identified the line number with grep and used head and tail to extract the surrounding context. For example: `head -n 520 SherlockHolmes.txt | tail -n 40`. This process efficiently analyzed the file and located specific information.

### Assignment 5.7: Digital forensics

Relevant screenshots + motivation

```

lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ exiftool oldcar.jpg
Aperture : 2.0
Image Size : 4160x3120
Megapixels : 13.0
Shutter Speed : 1/33
Thumbnail Image : (Binary data 59453 bytes, use -b option to extract)
GPS Altitude : 42 m Above Sea Level
GPS Date/Time : 2020:11:07 14:08:57Z
GPS Latitude : 53 deg 11' 39.68" N
GPS Longitude : 6 deg 32' 12.90" E
Focal Length : 3.5 mm
GPS Position : 53 deg 11' 39.68" N, 6 deg 32' 12.90" E
Light Value : 7.7
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ mv oldcar.jpg oldcar
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ file oldcar
oldcar: JPEG image data, JFIF standard 1.01, aspect ratio, density 1x1, segment length 16, Exif Standard: [TIFF image data, big-endian, direntries=10, manufacturer=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resolutionunit=2, software=saljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys, datETIME=2020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ rm oldcar
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ 
```



I analyzed the oldcar.jpg file using exiftool to identify the phone brand/type and found GPS coordinates indicating the photo was taken in Groningen. I then renamed the file to oldcar (removing the extension) using mv oldcar.jpg oldcar and confirmed with file oldcar that Ubuntu still recognized it as a JPEG image, even without the .jpg extension.

### Assignment 5.8: Steganography

Relevant screenshots + motivation

```
Hit:4 http://nl.archive.ubuntu.com/ubuntu noble-backports InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
88 packages can be upgraded. Run 'apt list --upgradable' to see them.
lozovan@lozovan-VMware-Virtual-Platform: ~$ sudo apt install steghide
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
steghide is already the newest version (0.5.1-15).
0 upgraded, 0 newly installed, 0 to remove and 88 not upgraded.
lozovan@lozovan-VMware-Virtual-Platform: ~$ cd Downloads
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ ls
apple2.jpg code.zip example.tar.gz hello.zip output.gif
code email-base64.txt example.txt oldcar site.zip
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ steghide extract -sf apple2.jpg
Enter passphrase:
wrote extracted data to "message.txt".
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ ls
apple2.jpg code.zip example.tar.gz hello.zip oldcar site.zip
code email-base64.txt example.txt message.txt output.gif
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ cat message.txt
Hello class.
You have almost completed Week 5.
```

```
88 packages can be upgraded. Run 'apt list --upgradable' to see them.
lozovan@lozovan-VMware-Virtual-Platform: ~$ sudo apt install steghide
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
steghide is already the newest version (0.5.1-15).
0 upgraded, 0 newly installed, 0 to remove and 88 not upgraded.
lozovan@lozovan-VMware-Virtual-Platform: ~$ cd Downloads
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ ls
apple2.jpg code.zip example.tar.gz hello.zip output.gif
code email-base64.txt example.txt oldcar site.zip
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ steghide extract -sf apple2.jpg
Enter passphrase:
wrote extracted data to "message.txt".
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ ls
apple2.jpg code.zip example.tar.gz hello.zip oldcar site.zip
code email-base64.txt example.txt message.txt output.gif
lozovan@lozovan-VMware-Virtual-Platform: ~/Downloads$ cat message.txt
Hello class.
You have almost completed Week 5.
```

## Bonus point assignment – week 5

Make relevant screenshots + motivation:

Anastasuu - VMware Workstation

```

File Edit View VM Tabs Help || Type ...
Library Home Anastasuu 566741Lozovan 566741Lozovan

8) Logout 7) Ping host
1) Assign interfaces 8) Shell
2) Set interface IP address 9) pfTop
3) Reset the root password 10) Firewall log
4) Reset to factory defaults 11) Reload all services
5) Power off system 12) Update from console
6) Reboot system 13) Restore a backup

Enter an option: 7

Enter a host name or IP address: google.com

PING google.com (142.251.39.110): 56 data bytes
64 bytes from 142.251.39.110: icmp_seq=0 ttl=128 time=19.304 ms
64 bytes from 142.251.39.110: icmp_seq=1 ttl=128 time=13.311 ms
64 bytes from 142.251.39.110: icmp_seq=2 ttl=128 time=16.258 ms

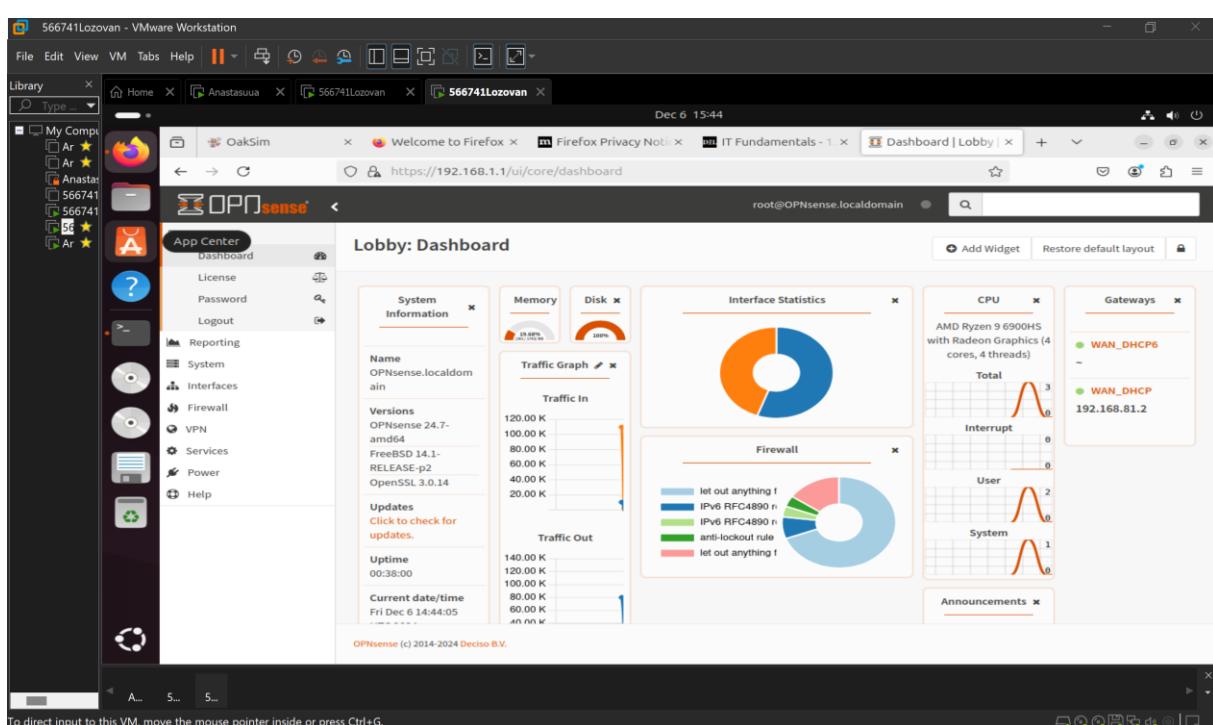
--- google.com ping statistics ---
3 packets transmitted, 3 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 13.311/16.291/19.304/2.446 ms

Press ENTER to continue.

A... S... 5...

```

To direct input to this VM, click inside or press Ctrl+G.



- Proof that the FOG server is installed and is functioning correctly.
  - Proof that the FOG server has made a back-up of the Windows11 VM or the Ubuntu 24.04 Desktop VM.

Ready? Save this file and export it as a pdf file with the name: **week5.pdf**