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Introduction to Mathematical Software
1$^{\text{st}}$ Exercise Sheet

Exercise 1 (Getting familiar with LINUX)

(a) Find out how much disk space you can use at most. How much disk space does your home directory and all its subdirectories use?

(b) Determine the absolute path of your working directory. List the whole contents of your home directory and find out which access rights the files in your home directory have. Does the file `.bash_history` exist? Find out which subdirectories there are in your home directory. List all files in our home directory, sorted by date.

(c) Find out what the command `less` is good for. (Hint: What does the command `man` do?) Then download the `textfile` from the Exercises section of the web page for this course and save it to your home directory. Look into it with `less`. Finally, create a directory named `exercise1` and move the `textfile` into it using the `mv` command.

(d) Get an idea of what the command `fgrep` does. Then change to the `exercise1` directory and find all lines of the textfile containing a capital letter X. Save the result to a file called `lines X` (note the whitespace in the filename). Now find all lines of the `textfile` containing a capital X as well as a small letter x and save the result to `lines Xx` (again, note the whitespace). How many lines of the `textfile` contain a capital X but no small letter x?

(e) Read the man-page for the `chmod` command and change the permissions of the directory `exercise1` by

- a symbolic representation of the changes
- an octal number representing the bit pattern for the new permissions

such that you have all permissions, your group has read permissions and all others have no permissions.

(f) In our home directory, create a file `.plan` with our name and course of studies. The contents of this file is shown whenever the command `finger` is used to display information about your userid. Find out if this mechanism works for your and your neighbor.

(g) Show the contents of the `/bin` directory pagewise.

(h) Write the output of the commands `ps` and `finger` into the file `output`.

(i) `wc` counts, depending on the option (`-clw`) characters, lines or words. Find out, using this command, how many files there are the `/bin` directory.

(j) Get a list of your last executed commands.

(k) Make a backup copy of the `textfile` using the `cp` command. Then delete all lines from the `textfile` containing the strings `network` or `Network`.

(l) Make a backup of the whole directory `exercise1`, then delete it with all its content using the commands `rm` or `rmdir`.

(m) Find out how often the string `byte` occurs in the manpage for `fgrep`.

(n) What is a shell script?
With shell scripts, it is actually possible to write complete programs. Take a look at the shell script `factorial.bash` form the Exercises section of the course web page and try to understand it (in order to test it, make it executable first). Change the script such that it computes the n-th Fibonacci number.

Exercise 2 (Maple)

(a) Take the *Ten Minute Tour* by clicking `Help` → `Take a Tour of Maple` → `Ten Minute Tour`

(b) Let Maple calculate the following expressions

$$\frac{2}{5} + \frac{7}{\frac{11}{13}} \qquad\qquad \frac{1}{\sqrt{3}} \sin\left(\frac{\pi}{3}\right) \qquad\qquad \int_0^\pi \frac{x^2}{x+1} \, dx$$

(c) Find out which of the following numbers are prime numbers: 107, 96199, 2497145999, 7171711711117, 7373737373737, 737373737373737.