Mathematical Software - Homework 2

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For each of the following exercises submit a .tex and a .pdf file.

Exercise 1. Create a Latex document containing the following pictures:

(a) The regular polygon with N-sides centered at the origin of the plane (see below). The number N of sides must be easy to change at will: you should use the `\pgfmathsetmacro` command to set a value for N at the beginning, so that changing only that number makes the whole picture change accordingly.
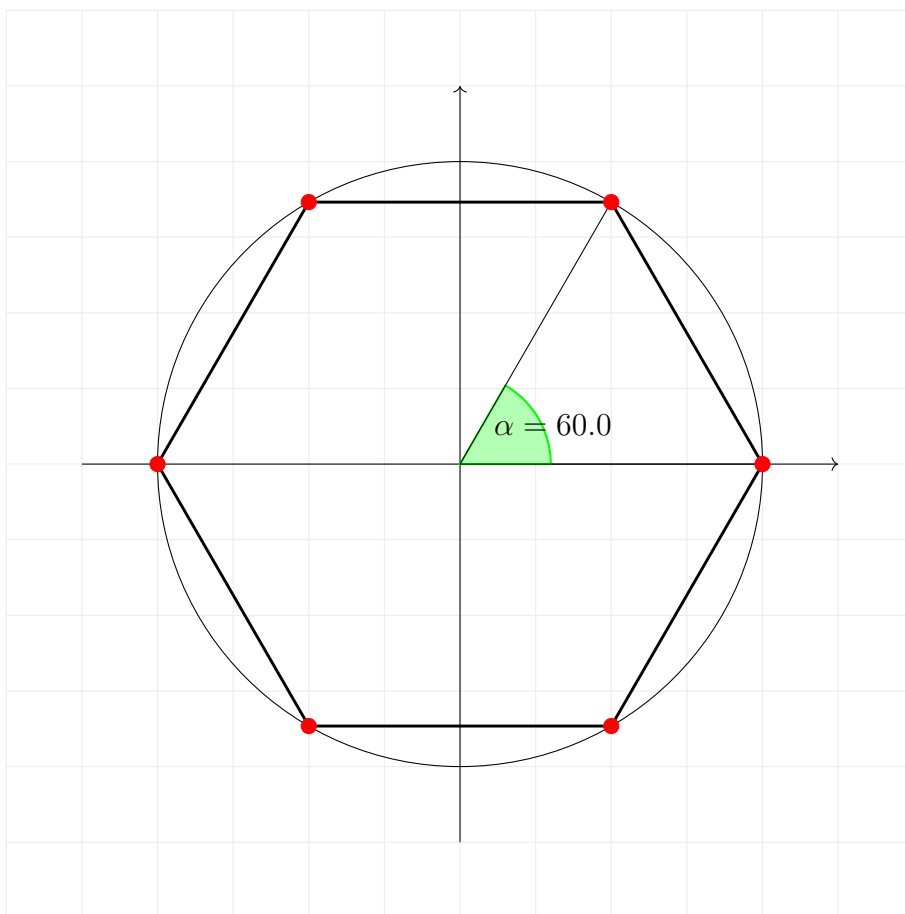
(b) The following commutative diagram:

Exercise 2. Suppose you have to give a short presentation (10 minutes) on a topic of your choice related to your study programme (you will not be asked to actually perform this presentation). You can choose to talk about a theorem you find important, a result you have seen in class or something else (see below for a list of possible topics). For example, if you talk about an important theorem you can give the theorem statement, explain why this theorem is important and/or possible applications of this result, and optionally an idea of the proof; but you can also deviate from this and talk for example about the historical background that lead to the development of this theorem.

Your task is to prepare slides for such a presentation using Beamer (Latex). Since the time for the (imaginary) presentation is very short, you should write 5-8 slides (you can have more if some contain very few or no words).

If you feel like certain slides do not make sense without your explanation (for example if you have one slide with just one picture and you plan to talk with the picture in background), you can write some comments in the .tex file.

If you can't think of a topic that you like, you can pick one of the following:

- The fundamental theorem of arithmetic (about prime numbers)

- The central limit theorem (probability theory)

- Differential equations (what they are, applications, methods to solve them...)

Grading

This homework assignment is worth 25% of your final grade.

Exercise 1 (10 points). Part (a) is worth 5 points, divided as follows:

- 3 points for obtaining a regular polygon whose number of sides can be changed by setting a variable with `\pgfmathsetmacro` (or in a similarly easy way).

- 1.5 points for other features of the picture (verteces, angle) that also change accordingly to the same variable.

- 0.5 points for the style of the other elements of the picture. This is a matter of personal preference and it does not need to be exactly the same as the picture, but some key features should remain (e.g. the grid lines should be less visible than the rest of the picture, the circle line style should be different from the polygon).

Part (b) is worth 5 points, divided as follows:

- 3 points if the nodes and arrows of the diagram are correct from a mathematical point of view (that is, the arrows point to the correct object).

- 1 point if the labels of the arrows are placed as shown in the picture above.

- 1 point for the correct style of the arrows (dashed, curved).

Exercise 2 (10 points).

- Producing a presentation that contains at least 4 slides is worth 5 points (but within reason: for example, the slides must not be empty).

- Up to 3 more points are given if the presentation is of a suitable length (watch out: both a presentation too short and one too long can loose points!). Comments in the .tex file can help me understand how long you plan to spend on each slide. If you are not sure how long your presentation is going to take, try it and write down how long each slide took.

- Up to 2 more points will be given if the slides "look nice" from the audience's perspective (e.g. not too many words on the same slides, are there nice pictures, etc).