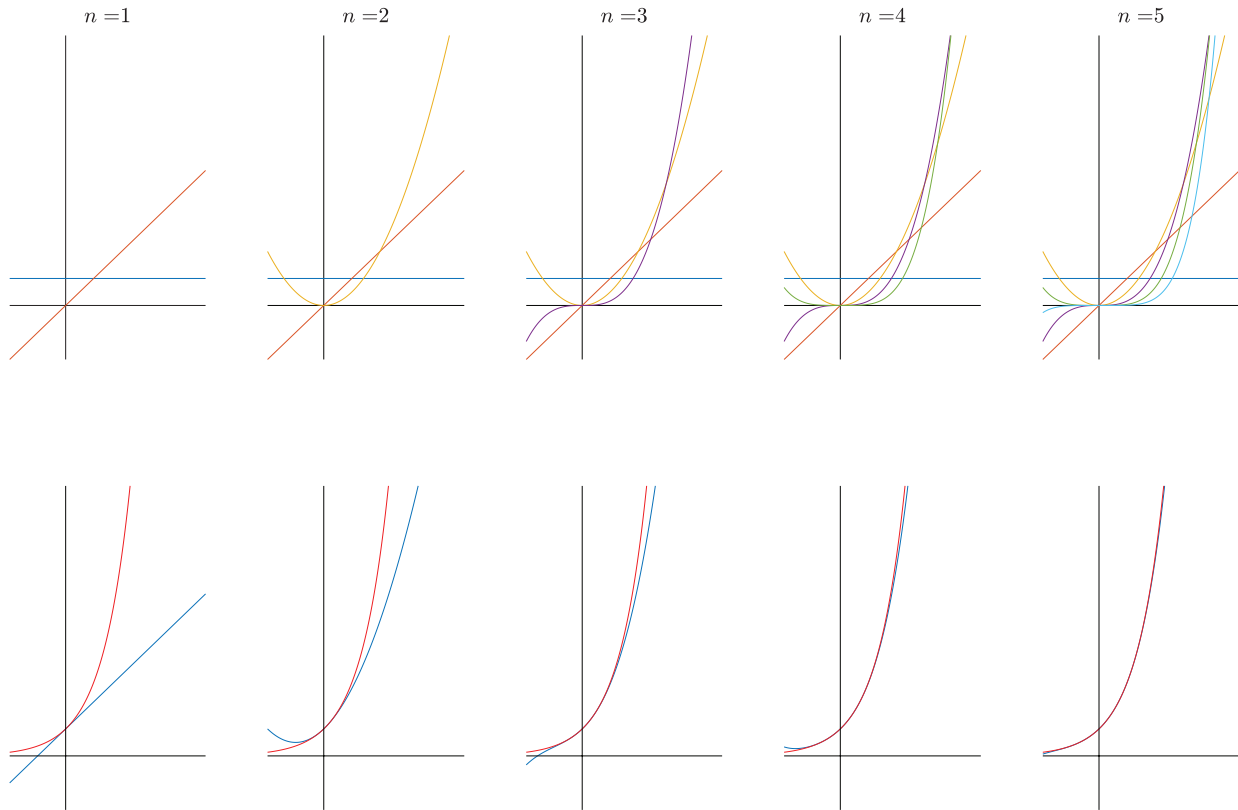**CK0030: Homework 02**

Exercise 1.1. The exponential function is the most important function in mathematics [Walter Rudin, *Real and complex analysis*, 1986.]. It is defined, for every complex number z by the formula

$$\exp(z) = \sum_{n=0}^{\infty} \frac{z^n}{n!}. \tag{1}$$

The series in Equation (1) converges absolutely for every z and converges uniformly on every bounded subset of the complex plane. Thus exp is a continuous function.

The absolute convergence of Equation (1) shows that the computation

$$\underbrace{\sum_{k=0}^{\infty} \frac{a^k}{k!} \sum_{m=0}^{\infty} \frac{b^m}{m!}}_{\text{(2a)}} = \underbrace{\sum_{n=0}^{\infty} \frac{1}{n!} \sum_{k=0}^{n} \frac{n!}{k!(n-k)!} a^k b^{n-k}}_{\text{(2b)}} = \underbrace{\sum_{n=0}^{\infty} \frac{(a+b)^n}{n!}}_{\text{(2c)}} \tag{2}$$

is correct and it gives the formula $\exp(a)\exp(b) = \exp(a+b)$, for all complex numbers a and b.

1. Write code that approximates the exponential function in Equation (1) using $n = 10$ terms. The code must be based on a `WHILE-loop` with condition set on the number of terms n.

   You are free to choose any argument value $z \in \mathcal{R}$.

2. Write code that verifies the equivalence of Equation (2a), Equation (2b) and Equation (2c). The implementation of the formulæ in Equation (2a) and Equation (2c) must be based on either `WHILE-loops` or `FOR-loops`. For Equation (2b), the code must be based on `FOR-loops`.

   You can choose any argument values $a, b \in \mathcal{R}$ and number of terms n (or m, k) $\in \{4, 5, 6, \dots\}$.

Instructions

[*Deadline*]: Submissions via SIGAA close Tuesday May 16, 2017 at 23:59:59 (Fortaleza Time).

[*Delays*]: Delayed submissions via email to `rafa.olv.lima@gmail.com`. Delays will be penalised.

[*Solutions*]: You can write your solutions in either Portuguese or English language. Solutions must be submitted as PDF or Plain Text files; Other formats (`.doc`, `.docx`, `.rtf` etc.) will not be considered. The LaTeX template available at the course website is recommended, though not obligatory.

[*About code*]: If the code is short (i.e., at most 3-page long, overall), it is okay to paste it to your solution sheet. Otherwise, it is more appropriate to either package it (`zip`) together with your solution sheet, or provide a link in your submission for us to download it (Note: If you opt for the link, it is your responsibility/risk to make sure that the link is fully functioning also after deadline.)

[*Others*]: Collaborations and solutions inspired by other people's work will be tolerated only within the limits explained in the website. Plagiarism will not be tolerated and will be reported to the UFC.