Home Work (1) - Numerical Analysis

Teddy

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1 IDE Install

Assuming you have Windows 7/10 on your computer, you can download the recommended Pycharm (any other IDE is fine too) at the following link:

https://www.jetbrains.com/pycharm/download/download-thanks.html?platform=windows

Just download the file, double-click it and click "next" and "I agree" until the software is installed. Then, open Pycharm and make a new project. You may define an interpreter. Just download it from:

https://www.python.org/downloads/release/python-374/

Now, reset Pycharm and you should find the interpreter. Just use it for now. You may read about virtual environment in Python, but it won't be necessary in this course.

2 Submission

You must submit your Homework until the 3.12.19, 23:59 pm [Israel time]. Include your full name and ID number. A work without full name and ID number won't be excepted. You must submit your home work with all the questions answered.

The submitting is by email. Please submit your work as a single PDF file (with the texts, graphs, and calculation plots) and a single code file (you may work with few, but merge and submit only one).

The email is: **lazebnik.teddy@gmail.com**. Note: this is also my personal email, please do not abuse it.

In case of reserve or illness, please send me an email in advance.

3 Biro

Reception hours: each week from **14:00 to 15:00 on Tuesday**. I highly recommend to email me at least 24 hours before you plain to come to make sure I am indeed in the office.

The office is located at **Building number 203, Room number 109, Bar Ilan University**.

For any question, my email address is: **lazebnik.teddy@gmail.com**.

4 Home Work

- Prove that $f(x) = e^{\frac{-1}{x^2}}$ if $x \neq 0$ else 0, can not be approximate at $x = 0$ using Taylor series.
- Find n in Taylor series such that approximate the function $f(X) = \frac{sin(\pi x)}{2}$ at point $x = \pi$ with 6 digits after the dot. (Assume your computer using 64bit floating point representation).
- Implement a function that gets $a \in \mathbf{N}$ and returns $a!$. You may not use any library. Bonus of using recursion.
- Implement a function that gets $a, b \in \mathbf{N}$ and returns a^b. You may not use any library. Bonus of using recursion.
- Implement a function of Taylor series for $f(x) = e^x$.
- Implement the 'bisection' method as a function and show a calculation (each step in a separated line) of the function $f(x) = \frac{\ln(x^2)+x^2}{e^x} - 0.5$
- show in graph (plot of the function and each point of calculation with a index next to it) the problem of using Newton–Raphson method on the function $f(x) = x^3$ to find the point $x = 0$. Assume $x_0 = 1$. Explain why this is happens.