Math 4610 Fundamentals of Numerical Analysis: Tasksheet 2 Problems/Questions

The problems for the Tasksheet 02 are included below. The deadline for turning in your work on these problems will be posted on the repository. In addition, you will turn in your work through the math4610 repository. A directory will be constructed that will be used as a place to store your work.

Tasks

Task 1: After deciding which programming language you will use, write a program that provides a response like that in the "Hello World!" output. Provide details of the compilation and execution of the code you write. Use a suitable response for the Python line "...it's only a bunny ..."

Task 2: Edit the main README.md file in your Math 4610 repository on Github using your favorite browser. This means logging on to your Github account, navigating to the README.md file in the math4610 repository, and editing the file on Github. In the README.md file, create an introduction that describes what the repository is being created for and put in a link to the table of contents for the homework problems and a link to the software manual you will create. Do this in Markdown - not html.

Task 3: Create the table of contents in a file with a name like

```
toc/task_toc.md
```

or something like this. After completing the tasks to this point, clone the repository to a local directory on a local computer using git. If you have already cloned the repository, use a

```
koebbe% git pull
```

command to pull the changes to your local copy of the repository..

Task 4: Now for something completely different - write out the analysis for the centered difference approximation in a Taylor series expansions. Show that the approximation is second order.

Task 5: Determine the order of accuracy of the central difference approximation of the second derivative. That is, analyze the approximation

$$f''(x) \approx \frac{f(x+h) - 2f(x) + f(x-h)}{h}$$

via Taylor series expansions. Write a code that approximates the second derivative of the function

$$f(x) = cos(x)$$

at the point, $x = 2.0$. Use, $h = 1.0, 0.5, 0.1, 0.01, 0.001, \ldots, 10^{-16}$. Create a table of difference values between the "exact" value of the second derivative.

Task 6: Search the internet for information regarding finite difference approximations of derivatives of different orders. Give examples of these types of approximations. You should be able to find many such examples. Write a brief paragraph (3 or 4 sentences) that describe your findings. Include links to the sites you cite.

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