FYS3150 Project 1

Your name(s) here
(Dated: September 1, 2021)

https://github.com/nevlunghavn/fys3150

PROBLEM 1

Given the one-dimensional Poisson equation

$$-\frac{d^2u}{dx^2} = f(x) = 100e^{-10x}, \tag{1}$$

we wish to show that

$$u(x) = 1 - (1 - e^{-10})x - e^{-10x} \tag{2}$$

is a solution. Differentiating 2 twice

$$\frac{du}{dx} = (1 - e^{-10})x - e^{-10x}$$
$$\Rightarrow -\frac{d^2u}{dx^2} = 100e^{-10x}$$
$$= f(x)$$

$\square$

PROBLEM 2

- The C++ program `problem2.cpp` in the github repository is a basic program consisting of three functions: a function to generate and return the x array, a function to evaluate equation 2 at each x value and return the $u(x)$ array and the main function which calls the former and writes the results to a file. The range of x values is set to $x \in [0,1]$ as specified in the introduction.

- The Python program `problem2.py` in the github repository is used to read the data file produced by the C++ program and plot the data using `matplotlib`. The resuling plot is shown in figure 1.

Next up is a table, created using the `table` and `tabular` environments. We refer to it by table I.
Finally, we can list algorithms by using the `algorithm` environment, as demonstrated here for algorithm 1.

Number of points	Output
10	0.3086
100	0.2550

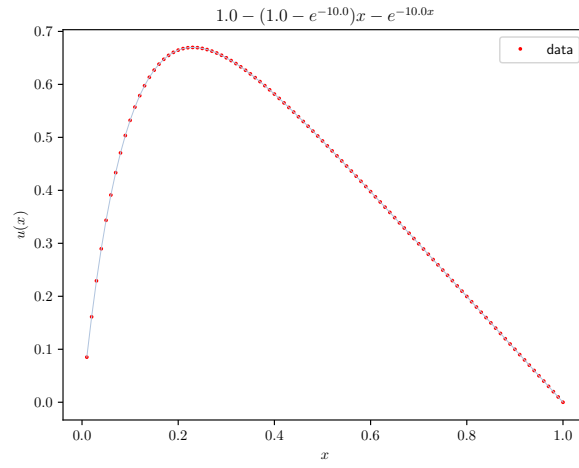TABLE I. Write a descriptive caption here, explaining the content of your table.

FIG. 1. Equation 2 is evalated at a descrete set of points shown in red. The blue line has no significance and is only a visual aid.

Algorithm 1 Some algorithm

    Some maths, e.g $f(x) = x^2$. $\triangleright$ Here's a comment
    for $i = 0, 1, ..., n - 1$ **do**
        Do something here
    while Some condition **do**
        Do something more here
    Maybe even some more math here, e.g $\int_0^1 f(x)\mathrm{d}x$