

Project 1

Cory Balaton & Janita Willumsen

(Dated: September 7, 2023)

<https://github.uio.no/FYS3150-G2-2023/Project-1>

PROBLEM 1

$$\begin{aligned}u(x) &= \int \int \frac{d^2 u}{dx^2} dx^2 \\&= \int \int -100e^{-10x} dx^2 \\&= \int \frac{-100e^{-10x}}{-10} + c_1 dx \\&= \int 10e^{-10x} + c_1 dx \\&= \frac{10e^{-10x}}{-10} + c_1 x + c_2 \\&= -e^{-10x} + c_1 x + c_2\end{aligned}$$

Using the boundary conditions, we can find c_1 and c_2 as shown below:

$$\begin{aligned}u(0) &= 0 \\-e^{-10 \cdot 0} + c_1 \cdot 0 + c_2 &= 0 \\-1 + c_2 &= 0 \\c_2 &= 1\end{aligned}$$

$$\begin{aligned}u(1) &= 0 \\-e^{-10 \cdot 1} + c_1 \cdot 1 + c_2 &= 0 \\-e^{-10} + c_1 + c_2 &= 0 \\c_1 &= e^{-10} - c_2 \\c_1 &= e^{-10} - 1\end{aligned}$$

Using the values that we found for c_1 and c_2 , we get

$$\begin{aligned}u(x) &= -e^{-10x} + (e^{-10} - 1)x + 1 \\&= 1 - (1 - e^{-10}) - e^{-10x}\end{aligned}$$

PROBLEM 2

PROBLEM 3

PROBLEM 4

PROBLEM 5

a)

b)

PROBLEM 6

a)

b)

PROBLEM 7

PROBLEM 8

PROBLEM 9

PROBLEM 10