

Project 2

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<https://github.uio.no/comPhys/FYS3150/tree/project2/project2>

PROBLEM 1 - SECOND ORDER DIFFERENTIAL EQUATION

In this problem we are looking at:

$$\gamma \frac{d^2 u(x)}{dx^2} = -Fu(x) \quad (1)$$

and

$$\frac{d^2 u(\hat{x})}{d\hat{x}^2} = -\lambda u(\hat{x}) \quad (2)$$

We know from the assignment that $\hat{x} \equiv x/L \Rightarrow x = \hat{x}L$ and $\lambda = \frac{FL^2}{\gamma}$, and by applying this, we can see that (2) is the scaled version of (1):

$$\begin{aligned} \gamma \frac{d^2 u(x)}{dx^2} &= -Fu(x) \\ \frac{d^2 u(x)}{dx^2} &= -\frac{Fu(x)}{\gamma} \end{aligned}$$

Put in $x = \hat{x}L$:

$$\begin{aligned} \frac{d^2 u(\hat{x}L)}{d(\hat{x}L)^2} &= -\frac{Fu(\hat{x}L)}{\gamma} \\ \frac{d^2 u(\hat{x})L}{d(\hat{x})^2 L^2} &= -\frac{Fu(\hat{x})L}{\gamma} \end{aligned}$$

Then we multiplies both sides with L :

$$\frac{d^2 u(\hat{x})L^2}{d(\hat{x})^2 L^2} = -\frac{Fu(\hat{x})L^2}{\gamma}$$

Now we can use $\lambda = \frac{FL^2}{\gamma}$ and we easily see that we get (2). ■

PROBLEM 2 - JACOBI'S ROTATION ALGORITHM**PROBLEM 3 - THE TRIDIAGONAL MATRIX****PROBLEM 4 - LARGEST OFF-DIAGONAL ELEMENT**

Problem a

Problem b

PROBLEM 5 - IMPLEMENTATION OF JACOBI'S ROTATION

Problem a

Problem b

PROBLEM 6 - TRANSFORMATIONS

Problem a

Problem b

PROBLEM 7 - EIGENVALUE PROBLEM

Problem a

Problem b