

## Project 2 FYS4150

Vetle Vikenes, Johan Mylius Kroken & Nanna Bryne

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The code is available on GitHub at <https://github.com/Vikenes/FYS4150>.

### INTRODUCTION

To describe a one-dimensional buckling beam, we have the second order differential equation

$$\gamma \frac{du}{dx} = -Fu(x), \quad x \in [0, L] \quad (1)$$

with  $u(0) = u(L) = 0$ . ...

### PROBLEM 1

We define  $\hat{x} \equiv x/L$ . Now  $d^2\hat{x}/dx^2 = L^{-2}$  and we can rewrite eq. (1).

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

Letting  $\lambda \equiv FL^2/\gamma$  yields

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

**PROBLEM 2****PROBLEM 3**

a)

b)

**PROBLEM 4**

a)

b)

**PROBLEM 5**

a)

b)

**PROBLEM 6**

a)

b)