Title of the document

Your name(s) here
(Dated: September 26, 2021)

PROBLEM 1.

Given

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

with the definition $\hat{x} = x/L$, such that

$$\frac{d\hat{x}}{dx} = \frac{1}{L} \implies dx = Ld\hat{x}$$

Equation 1 can be written

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

with $\lambda = FL^2/\gamma$. ■

PROBLEM 2.

For an arbitrary composite matrix $A = BC$ the transpose of $A^T = (BC)^T = C^TB^T$. Hence for $\vec{w}_i = U\vec{v}_i$

$$\vec{w}_i^T\vec{w}_j = \vec{v}_i^TU^TU\vec{v}_j = \vec{v}_i^T\vec{v}_i = \delta_{i,j}$$

as $U^TU = U^{-1}U = I$

PROBLEM 3.