Project 1 FYS3150

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Abstract

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Introduction

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Theory and technicalites

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Conclusion and perspectives

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For $i = 0$ and $i = n$ the boundary conditions gives us $v(0) = v(1) = 0$.
For $i = 1$

$$-\frac{v_2 + v_0 - 2v_1}{h^2} = f_1 \tag{1}$$

For $i = 2$

$$-\frac{v_3 + v_1 - 2v_2}{h^2} = f_2 \tag{2}$$

$\vdots$

For $i = n - 1$

$$-\frac{v_n + v_{n-2} - 2v_{n-1}}{h^2} = f_{n-1} \tag{3}$$

If you multiply both sides by h^2

$$-v_2 + v_0 - 2v_1 = h^2 \cdot f_1 \tag{4}$$

$$-v_3 + v_1 - 2v_2 = h^2 \cdot f_2 \tag{5}$$

$\vdots$

$$-v_n + v_{n-2} - 2v_{n-1} = h^2 \cdot f_{n-1} \tag{6}$$

Which you can rewrite as a linear set of equations where

$$A = \begin{bmatrix} 2 & -1 & 0 & \cdots & \cdots & 0 \\ -1 & 2 & -1 & 0 & \cdots & \cdots \\ 0 & -1 & 2 & -1 & 0 & \cdots \\ & \cdots & \cdots & \cdots & \cdots & \cdots \\ 0 & \cdots & \cdots & -1 & 2 & -1 \\ 0 & \cdots & \cdots & 0 & -1 & 2 \end{bmatrix}$$

$\hat{v} = \begin{bmatrix} v_1 & v_2 & \cdots & v_{n-1} \end{bmatrix}$

and

$\tilde{b_i} = \begin{bmatrix} \tilde{b_1} & \tilde{b_2} & \cdots & b_{\tilde{n-1}} \end{bmatrix}$

Where $\tilde{b_i} = h^2 \cdot f_i$

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Appendix

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Bibliography

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