Durham University Beamer Template

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Maths Crap

Some Maths Here

The Crank-Nicolson scheme is

$$U_j^{n+1} - U_j^n = \frac{\mu}{2}\left(U_{j+1}^{n+1} - 2U_j^{n+1} + U_{j-1}^{n+1} + U_{j+1}^n - 2U_j^n + U_{j-1}^n\right) \quad (1)$$

or as a matrix equation

$$\mathbf{A}U^{n+1} = \mathbf{B}U^n \quad (2)$$

Where $\mathbf{A}$ and $\mathbf{B}$ are

$$A = \begin{pmatrix} 1-\mu & -\frac{\mu}{2} & 0 & \cdots & 0 \\ -\frac{\mu}{2} & 1-\mu & -\frac{\mu}{2} & \ddots & \vdots \\ 0 & -\frac{\mu}{2} & 1-\mu & \ddots & 0 \\ \vdots & \ddots & \ddots & \ddots & -\frac{\mu}{2} \\ 0 & \cdots & 0 & -\frac{\mu}{2} & 1-\mu \end{pmatrix}$$

and

$$B = \begin{pmatrix} 1+\mu & \frac{\mu}{2} & 0 & \cdots & 0 \\ \frac{\mu}{2} & 1+\mu & \frac{\mu}{2} & \ddots & \vdots \\ 0 & \frac{\mu}{2} & 1+\mu & \ddots & 0 \\ \vdots & \ddots & \ddots & \ddots & \frac{\mu}{2} \\ 0 & \cdots & 0 & \frac{\mu}{2} & 1+\mu \end{pmatrix}$$