INF5620 - Exercise 3: FEM

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$\mathbf{f} = (1, 1, 1)$, $\varphi_0 = (1, 0, 0)$, $\varphi_1 = (0, 1, 0)$
$V = \text{span}\{\varphi_0, \varphi_1\}$ $\mathbf{u} \in V$

$$\mathbf{u} = \sum_{j=0}^{N} c_j \varphi_j \tag{1}$$

$$\sum_{j=0}^{N} A_{i,j} c_j = b_i \qquad i = 0, 1, 2, ..., N \tag{2}$$

$A_{i,j} = (\varphi_{\mathbf{i}}, \varphi_{\mathbf{j}})$ and $b_i = (\varphi_{\mathbf{i}}, \mathbf{f})$.

$A_{0,0} = (\varphi_{\mathbf{0}}, \varphi_{\mathbf{0}}) = 1.$
$A_{1,0} = (\varphi_{\mathbf{1}}, \varphi_{\mathbf{0}}) = 0 = A_{0,1}$.
$A_{1,1} = (\varphi_{\mathbf{1}}, \varphi_{\mathbf{1}}) = 1.$

$b_0 = (\varphi_{\mathbf{0}}, \mathbf{f}) = 1.$
$b_1 = (\varphi_{\mathbf{1}}, \mathbf{f}) = 1.$

This leads to $c_0 = 1$ and $c_1 = 1$ if we now insert this into eq.(1), we get

$$\mathbf{u} = (1, 0, 0) + (0, 1, 0) = (1, 1, 0) \tag{3}$$