

$$x u'' + u'' + u' - 1 = 0$$

$$u'(0) = 1$$

$$u(1) - u'(1) = 2$$

$$x_m = x_0 + n \cdot h$$

$$x \in (0, 1)$$

$$h = \frac{1-0}{m}$$

m - levels prediction

$$n \in \langle 1, m-1 \rangle$$

$$(x_{n+1}) (u''_n + u'_n - 1) = 0$$

$$(x+1) \frac{u_{n+1} - 2u_n + u_{n-1}}{h^2} + \frac{u_{n+1} - u_{n-1}}{2h} - 1 = 0$$

$$2(x+1)(u_{n+1} - 2u_n + u_{n-1}) + h(u_{n+1} - u_{n-1}) \stackrel{\text{miedziadziórki}}{=} -2h^2$$

$$u_{n+1}(2x_n + 2 + h) - u_n(4x_n + 4) + u_{n-1}(2x_n + 2 - h) = -2h^2$$

$$n=0$$

$$u'_0 = \frac{u_1 - u_{-1}}{2h} \Rightarrow u_{-1} = u_1 - u'_0 2h = u_1 - 2h$$

$$u''_0 = \frac{u_1 - 2u_0 + u_{-1}}{h^2} = \frac{2u_1 - 2u_0 - 2h}{h^2}$$

$$(x_0+1) \cdot \frac{2u_1 - 2u_0 - 2h}{h^2} + \underbrace{u'_0}_{0} - 1 = 0$$

$$u_1(2x_0 + \frac{2}{h}) - (2x_0 + 1)u_0 - \underbrace{2h(x_0 + 1)}_{\text{miedziadziórki}} = 0$$

$$n=m$$

$$u'_m = \frac{u_{m+1} - u_{m-1}}{2h} \Rightarrow u_{m+1} = u'_m 2h + u_{m-1} = -(u_m - u'_m)2h + 2hu_m + u_{m-1} = -4h + 2hu_m + u_{m-1}$$

$$u''_m = \frac{-4h + 2hu_m + u_{m-1} - 2u_m + u_{m-1}}{h^2} = \frac{2u_{m-1} - 2u_m + 2uh - 4h}{h^2}$$

$$(2h-2)(x_n+1) = 2hx_n + 2h - 2x_n - 2$$

$$(x_n+1) \frac{2x_{n-1} - 2x_n + 2x_n h - 4h}{h^2} - 4h + 2hx_n + u_{n-1} - 1 = 0$$

$$(x_n+1) \left( \frac{2x_{n-1}}{h^2} + 2u_n(h-1) - 4h \right) - 4h^3 + 2h^3 u_n + h^2 u_{n-1} - h^2 = 0$$

$$u_{n-1} \underbrace{(h^2 + 2x_n + 2)}_{z_1} + u_n \underbrace{(2h^3 + 2hx_n + 2h - 2x_n - 2)}_{z_2} + \dots = 0$$

mischkürzung

$$\begin{bmatrix} 1 & 2 & 0 & \dots & 0 \\ 2x_n+2-h & 4x_n+4 & 2x_n+2+h & & \\ 0 & 0 & 0 & \ddots & \\ \vdots & \vdots & \vdots & \ddots & \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} u_0 \\ u_1 \\ \vdots \\ u_n \end{bmatrix} = \begin{bmatrix} 0 \\ 2h^2 \\ \vdots \\ 2h^3 + 4h(x_n+1) \end{bmatrix}$$

$$x_n = x_0 + n \cdot h = nh$$

$$Av = f$$

$$v = f \cdot A^{-1}$$