

Shooting method:

- Easy ☺
- Breakable → may fail to conv. as root-finding
→ may go unstable

Finite difference method

clear: $u''(x) = f(x)$ $u(0) = a$ $u(1) = b$

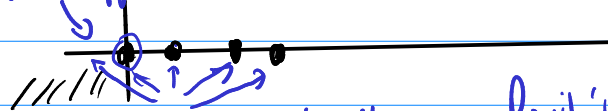
u_0 u_i u_{n-1}

Replace: (e.g.)

$$u'(x) = \frac{u(x+h) - u(x-h)}{2h}$$

$$u''(x) = \frac{u(x+h) - 2u(x) + u(x-h)}{h^2}$$

what happens here?



Possibility: biased stencil

$$\begin{cases} u_0 & = a \\ u_0 - 2u_1 + u_2 & = r_1 \\ u_1 - 2u_2 + u_3 & = r_3 \end{cases}$$

Galerkin / finite elements

$$u''(x) = f(x) \quad \rightarrow \quad u''(x) - f(x) = 0$$

$$v(x) = \sum_{i=1}^n \alpha_i \varphi_i(x)$$