

Ejemplo de problema estacionario 1D

(MAL PUESTO)

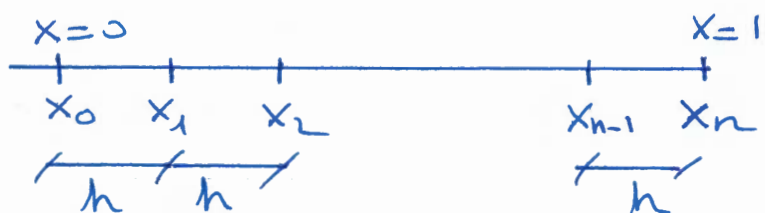
$$u_x = x, \quad x \in (0, 1)$$

$$u(0) = 1$$

$$u(1) = 2$$

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Discretización:



$$h = 1/n, \quad x_i = x_0 + i h = i/n$$

Imporemas:
$$\boxed{(u_x - x) \Big|_{x=x_i} = 0, \quad i = 1, \dots, n-1}$$

$$u_x \Big|_{x=x_i} = \frac{u(x_{i+1}) - u(x_{i-1}))}{2h} + \mathcal{O}(h^2) \quad (*)$$

$$\Rightarrow \begin{cases} \frac{u(x_{i+1}) - u(x_{i-1}))}{2h} - x_i + \mathcal{O}(h^2) = 0 & ; i = 1, \dots, n-1 \\ \frac{\hat{u}_{i+1} - \hat{u}_{i-1}}{2h} - x_i = 0 & ; i = 1, \dots, n-1 \end{cases}$$

$$(*) \quad u_{i+1} = u_i + u'_i h + \frac{u''_i h^2}{2} + \frac{u'''_i h^3}{6} + \frac{u^{(4)}_i h^4}{24} + \mathcal{O}(h^5)$$

$$u_{i-1} = u_i - u'_i h + \frac{u''_i h^2}{2} - \frac{u'''_i h^3}{6} + \frac{u^{(4)}_i h^4}{24} + \mathcal{O}(h^5)$$

$$u_{i+1} - u_{i-1} = 2h u'_i + \frac{2h^3}{6} u'''_i + \mathcal{O}(h^5)$$

$$\Rightarrow u'_i = \frac{u_{i+1} - u_{i-1}}{2h} - \underbrace{\frac{h^2}{6} u'''_i}_{\mathcal{O}(h^2)} + \mathcal{O}(h^4)$$

