Równanie falowe:

$$\frac{\partial^2 u(x,t)}{\partial t^2} = c^2 \frac{\partial^2 u(x,t)}{\partial x^2}$$

c^2 – prędkość rozchodzenia się fali

x – pozycja

t – czas

$\frac{\partial^2 u(x,t)}{\partial x^2}$ – miara zakrzywienia

Ezestaw 5

$$\frac{\partial^2}{\partial x^2} u(x,t) \approx \frac{\tilde{u}\left((i+\frac{1}{\Delta})\Delta, t\right) - \tilde{u}(i\cdot\Delta, t)}{\Delta} =$$

gdzy Δ jest "małe"

$= \dots$

$$x \in (0,1) \quad \sim \quad x = 0, 0+\Delta, 0+2\Delta, \dots, 1$$

"małe"

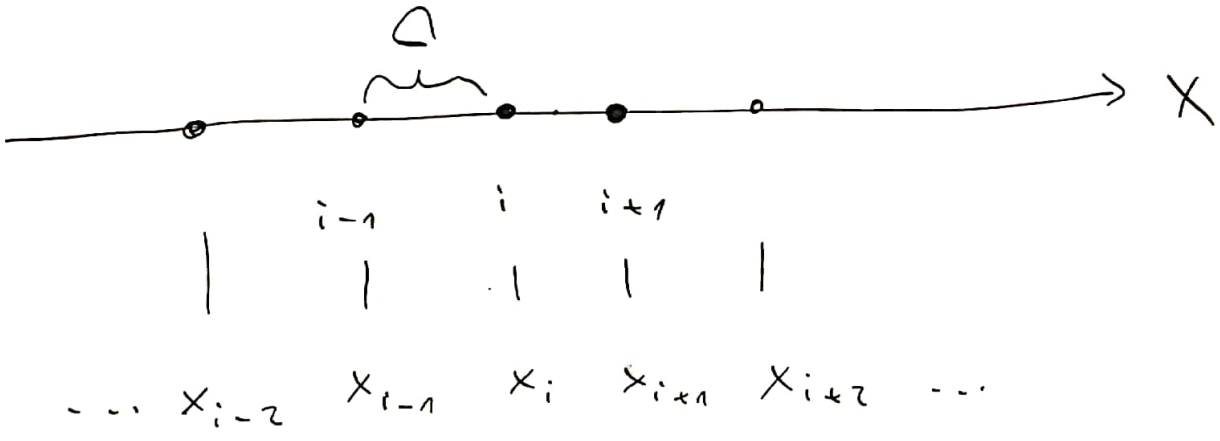
$$\frac{\partial}{\partial x}\left(\underbrace{\frac{\partial}{\partial x} u(x,t)}_{\hat{u}(x,t)}\right)$$

$$X_i = i \cdot \Delta$$

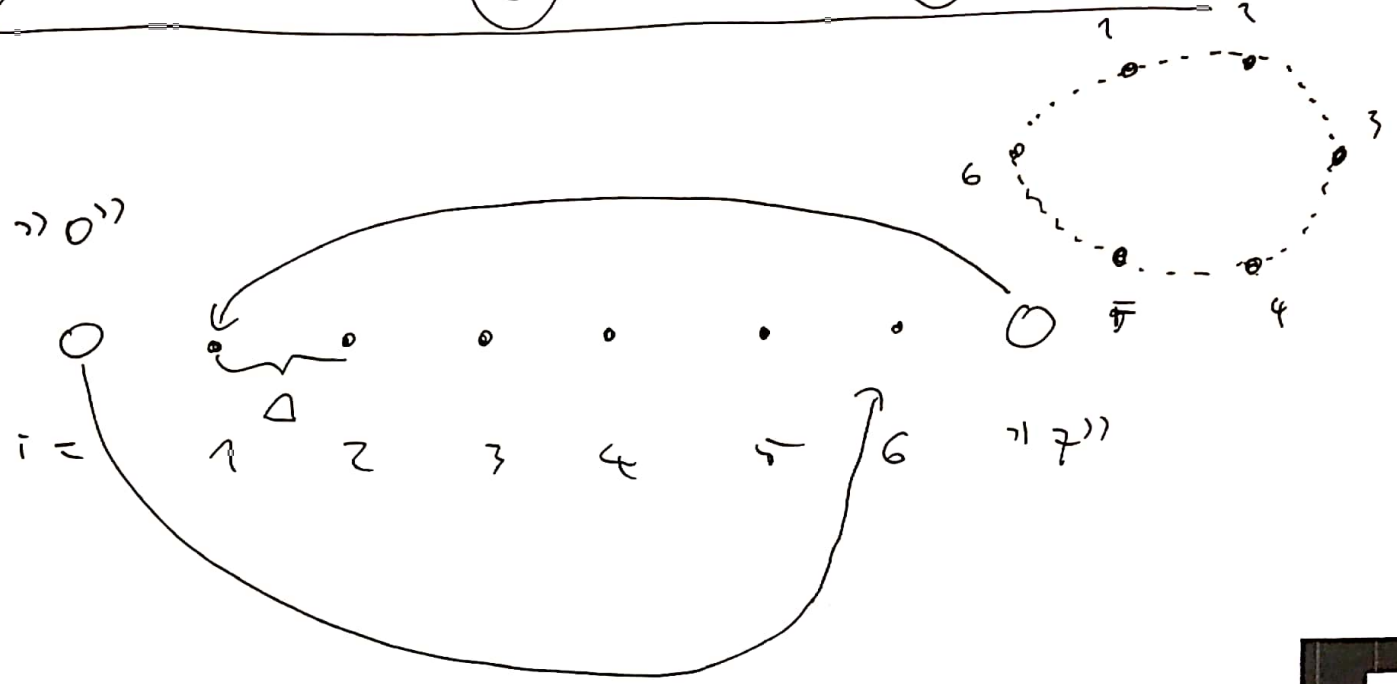
$$X_i = i \circ \Delta$$

$$\dots = \frac{\frac{u((i+1)\cdot\Delta,t) - u(i\cdot\Delta,t)}{\Delta} - \frac{u(i\cdot\Delta,t) - u((i-1)\Delta,t)}{\Delta}}{\Delta} =$$

$$= \frac{u((i+1)\cdot\Delta,t) - 2\,u(i\cdot\Delta,t) + u((i-1)\Delta,t)}{\Delta^2} = \dots$$



$$= \frac{1}{\Delta^2} u((i+1)\cdot\Delta, t) - \frac{2}{\Delta^2} u(i\cdot\Delta, t) + \frac{1}{\Delta^2} u((i-1)\Delta, t) =$$



$N = 6$

$$\frac{\partial^2 u(x,t)}{\partial t^2} = c^2 \underbrace{\frac{\partial^2 u(x,t)}{\partial x^2}}_{22}$$

$$\Downarrow$$

$$\frac{\partial^2 u(x,t)}{\partial t^2} = c^2 \left[A \cdot \begin{pmatrix} u(x_1,t) \\ u(x_2,t) \\ \vdots \\ u(x_N,t) \end{pmatrix} \right]$$

$$\underbrace{A \cdot v = \lambda \cdot v}_{\uparrow \; \uparrow}$$

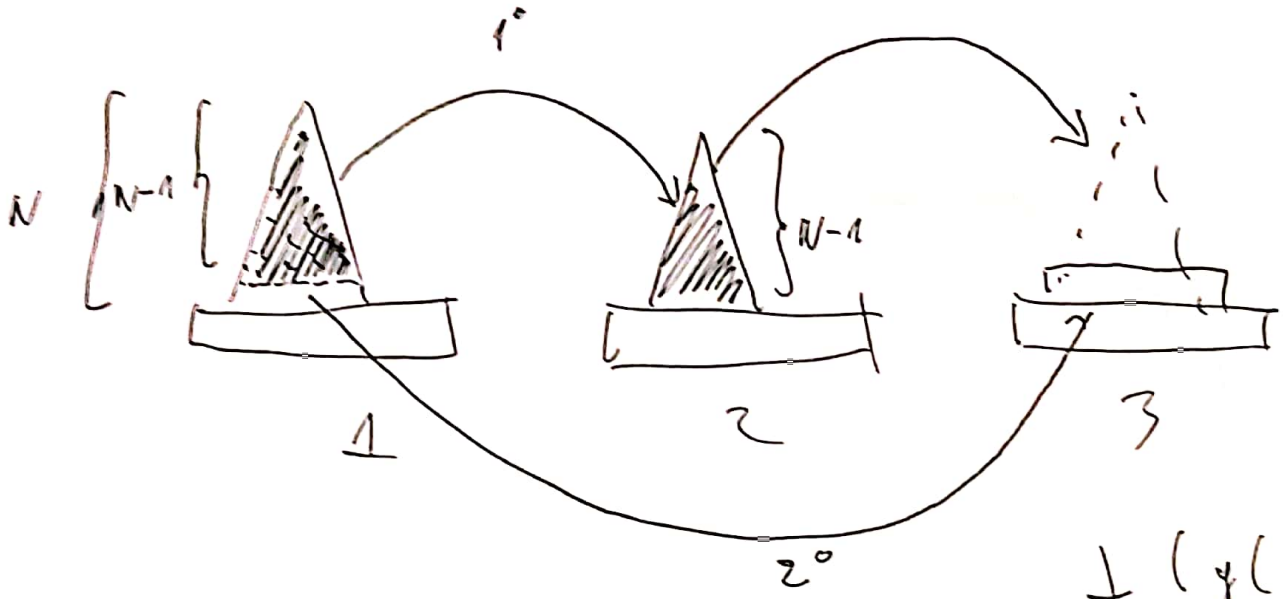
Eigensystem [ ]

$$A \cdot v_1 = \lambda_1 \cdot v_1$$

$$\left(u = v_1\right)$$

$$\frac{\partial^2 u}{\partial t^2} \begin{pmatrix} v_1(x_1,t) \\ v_1(x_2,t) \\ \vdots \\ v_1(x_N,t) \end{pmatrix} = c^2 \lambda_1 \cdot v_1 \begin{pmatrix} v_1(x_1,t) \\ v_2(x_2,t) \\ \vdots \\ v_N(x_N,t) \end{pmatrix}$$

$$\boxed{\frac{\partial^2}{\partial t^2} v = c^2 \cdot \lambda \cdot v}$$



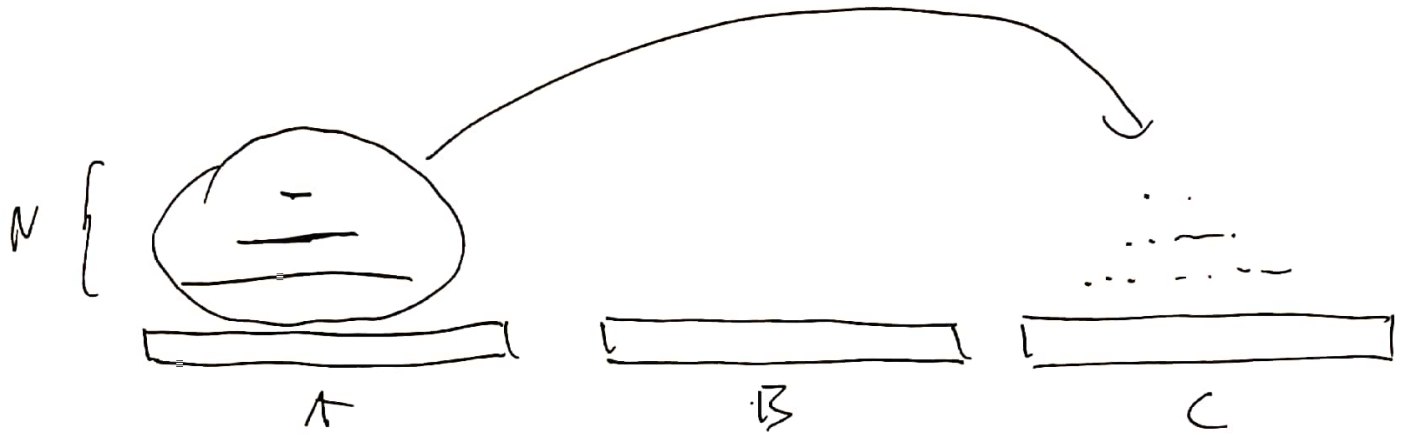
$$t\,(g(h(\ldots))) \;=\; (t \circ g \circ h)(\ldots)$$

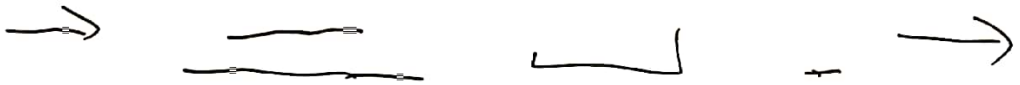
move[other, j, n-1]
2 3

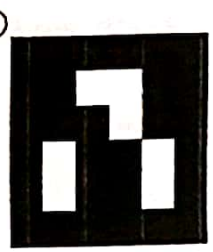
[move[i, j, 1]] [move[i, other, n-1][t]]
1 3 1 2

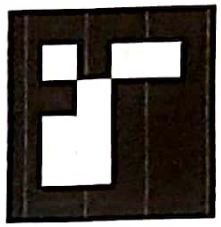
1°

2


N
A
B
C








A
B
C