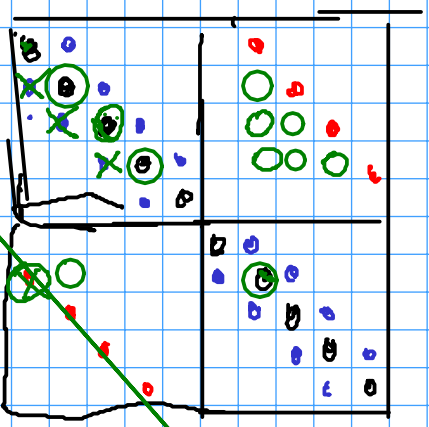
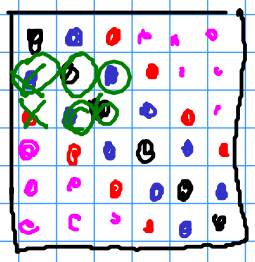
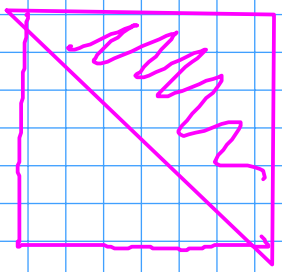






$$\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \Rightarrow A_x + A_y$$

$$u^{n+1} - u^n = \Delta t \left(\frac{A_x}{2}(u^{n+1} + u^n) + \frac{A_y}{2}(u^{n+1} + u^n) \right)$$

$$u^{n+1/2} - u^n = \frac{\Delta t}{2}\left(A_x u^{n+1/2} + A_y u^n\right)$$

$$u^{n+1} - u^{n+1/2} = \frac{\Delta t}{2}\left(A_x u^{n+\frac{1}{2}} + A_y u^{n+1}\right)$$

$$u^{n+1} - \frac{\Delta t}{2} A_y u^{n+1} = u^{n+1/2} + \frac{\Delta t}{2} A_x u^{n+\frac{1}{2}}$$

$$\frac{u^{1/3} - u^{0}}{\Delta t} = A_x u^{1/3} + A_y u^{0} + A_z u^{0}$$

$$\frac{u^{2/3} - u^{1/3}}{\Delta t} = A_x u^{1/3} + A_y u^{2/3} + A_z u^{0}$$

$$\frac{u^2 - u^1}{\Delta t} = u^2 \underbrace{u^1 u^0 u^{-1}}$$

$$\frac{u^{1/3} - u^0}{\Delta t/3} = A_x u^{1/3} + (A_y + A_z) u^0$$

$$\frac{u^{2/3} - u^0}{\Delta t/3} = A_x u^{1/3} + \underbrace{(A_y + A_z) u^{2/3}}$$

$$(A_x + A_y) \Rightarrow A_x u^{1/2} + A_y u^0$$
$$A_x u^{1/2} + A_y u^1$$

$$A_x u^{1/2} + (A_y + A_z) u^0$$

$$(A_y + A_z) u^0 \Rightarrow A_y u^0 + A_z u^{1/2}$$
$$+ A_y u^1 + A_z u^{1/2}$$

$f(x) \Rightarrow f_j \qquad \hat{f}(k) = \int e^{ikx} f(x)\, dx$

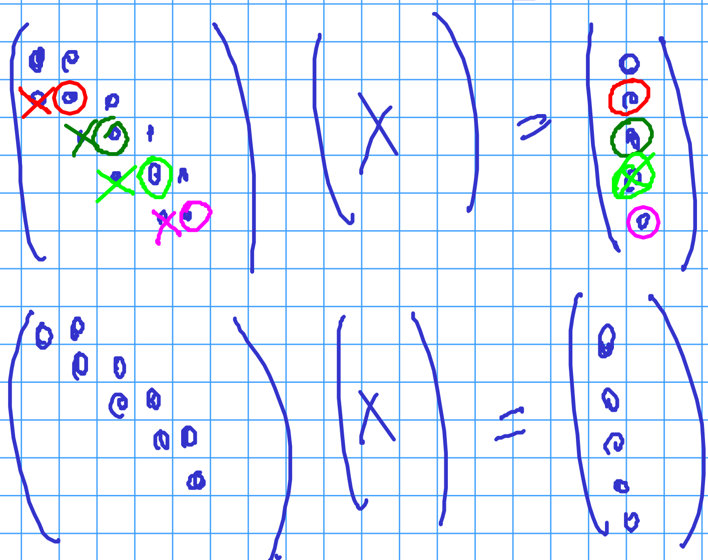
$$\hat{f}(k) = \sum_j e^{ik(\Delta x j)} f_j$$

$$\hat{f}(\ell \Delta k) = \sum_j \underbrace{e^{i \ell \Delta k j \Delta x}}_{N} f_j$$

$f_J \quad H \rightarrow \int N \qquad e^{i(\ell J)\Delta k \Delta x}$

$$A \, x = b$$

$$A, b \rightarrow x$$



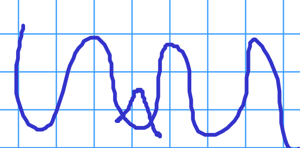
$$a_{44} x_4 + a_{45} x_5 = b_4$$

$$x_5 = b_5 / a_{55}$$

$$x_4 = \frac{b_4 - a_{45} x_5}{a_{44}}$$

$$\partial_t u = (\partial_x f + D \partial_x^2) u$$

$$f = \cos kx + \cos \omega t$$



$$\partial^2_{t^2} u - \partial^2_{x^2} u = f u$$

|| Note per risolvere Eq onde gravità

$$\begin{pmatrix} u \\ w \end{pmatrix} \qquad w = \partial_t u + \partial_x u$$

$$\begin{cases} \partial_t u + \partial_x u = w \\ \partial_t w - \partial_x w = f u \end{cases}$$