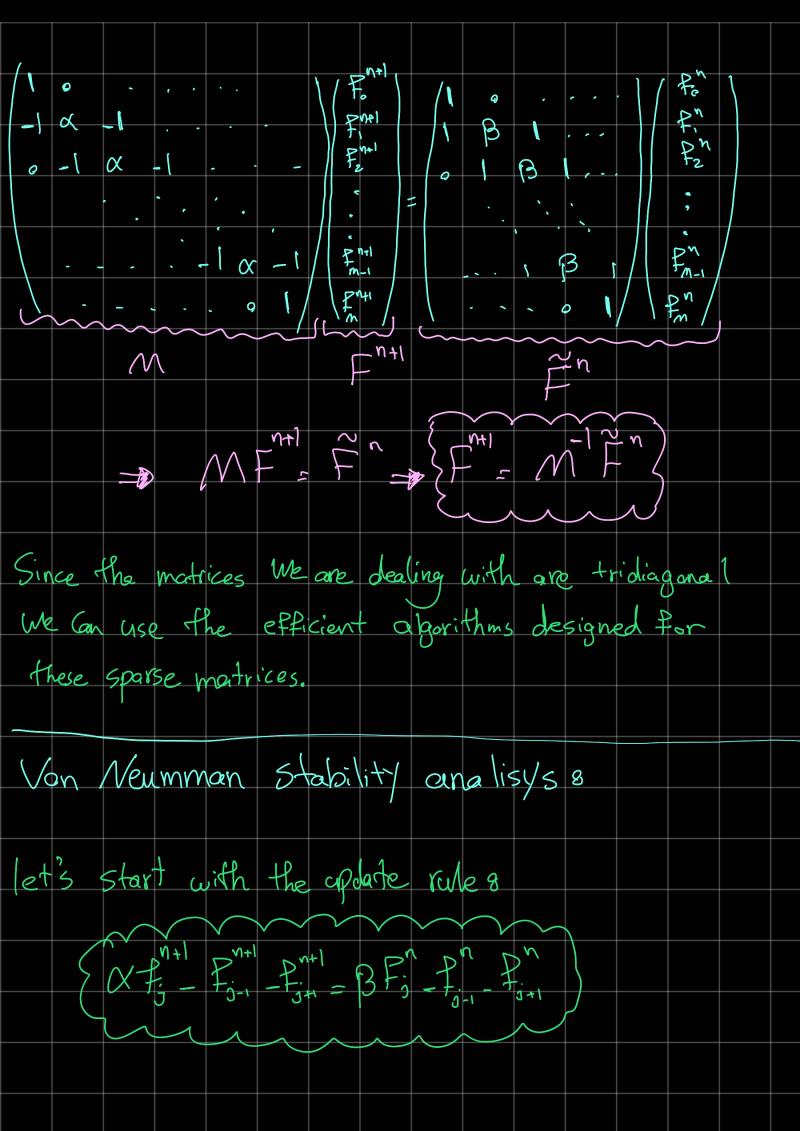
Crank_Nicolson method for Diffusion Crank Nicolsom method Can produce better approximation and more stable solution to partial differential equ. C-N method in fact approximates the derivities at time tot. 2F(x, t+01/2)= P3-P3'
At $\frac{\partial F}{\partial x^{2}}(x, t+\underline{\Delta t}) = \frac{1}{2} \left(\frac{F_{j-1}^{n} - 2F_{j}^{n} + F_{j+1}^{n}}{(\Delta x)^{2}} \right)$ Fi, -27 + 7 7+1 \\\(\alpha\)^2 OF DOF Ot Ox2 $= \frac{1}{2000} \cdot \frac$ $\Rightarrow (2+2) + 2 + 2 + 3 + 3 + 4 + 3 + 4 + 3 + 4 + 3 + 1$ 915 you can see this mothad is implicit, so we need to Salve simultaneous equations at each time step.



as I have fully covered in explicit FDA for Diffusion, we Can Write inverse faurier transform as & NOW We can isert above equation in update rule. Note that as you can see we should insert a whole sum (20) instead of each term in the update rule. but since every thing is linear, we can use just one term in Sum (in fact the equality must hold for each element is the sum $\sum_{j=1}^{N-1} \sum_{k=0}^{N-1} E[h, N\pm i] \exp(\frac{i2\pi kj}{N})$ $S_{j\pm 1} = \sum_{h=0}^{N-1} E[h, n] exp\left(\frac{i2\pi h[j\pm 1]}{N}\right)$ \Rightarrow $E[h,n]exp(\frac{22\pi hj}{N})= \prod_{j=1}^{n}; exp(\frac{2\pi h}{N})=e^{\frac{23\pi hj}{N}}$ > plug in the update rule & $\times \bigcup_{j=1}^{n+1} \bigcup_{j=1}^{n+1} e^{iS} = \bigcup_{$

