CN 1D growth rate

$$\frac{T_j^{n+1} - T_j^n}{\Delta t} = \frac{\alpha}{2\Delta x^2}\Big[T_{j-1}^{n+1} + T_{j+1}^{n+1} - 2T_j^{n+1} + T_{j-1}^{n} + T_{j+1}^{n} - 2T_j^{n}\Big]$$

$$G^{n+1} \cdot e^{ikj\Delta x} - G^n \cdot e^{ikj\Delta x} = \frac{\alpha \Delta t}{2\Delta x^2} G^{n+1}\Big[e^{ik(j-1)\Delta x} + e^{ik(j+1)\Delta x} - 2e^{ikj\Delta x}\Big] + \frac{\alpha \Delta t}{2\Delta x^2} G^{n}\Big[e^{ik(j-1)\Delta x} + e^{ik(j+1)\Delta x} - 2e^{ikj\Delta x}\Big]$$

$$G^{n+1} - G^n = \frac{C}{2} G^{n+1}\Big[e^{-ik\Delta x} + e^{ik\Delta x} - 2\Big] + \frac{C}{2} G^{n}\Big[e^{-ik\Delta x} + e^{ik\Delta x} - 2\Big]$$

$$G^{n+1}\left(1 - \frac{C}{2}(2\cos(k\Delta x) - 2)\right) = G^n\left(1 + \frac{C}{2}(2\cos(k\Delta x) - 2)\right)$$

$$\frac{G^{n+1}}{G^n} = \frac{1 + C(\cos(k\Delta x) - 1)}{1 - C(\cos(k\Delta x) - 1)}$$

When the cos term is 1, the growth rate is 1. When the cos term is -1, the rate is $\boxed{\dfrac{1-2C}{1+2C}}$ which is between -1 and 1, getting very close to 1 as $C \to 0$, and close to -1 as $C \to \infty$. At $C = .5$, the rate is 0. Does this mean we can eliminate the error in one step by choosing Δt and Δx carefully?