KLEIN-GORDON AND FFT.

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$$\frac{\partial^2 \eta}{\partial t^2} - \frac{\partial^2 \eta}{\partial x^2} + q\eta = 0 \tag{1}$$

Initial condition

$$\eta(x,0) = e^{-(\frac{x}{L})^2}, \quad \frac{\partial}{\partial t}\eta(x,0) = 0 \tag{2}$$

Parameters $L = 10$, $q = 0.1$.

Legends/Methods

1. Num. :Finite differences
2. SFM : Stationary phase
3. FFT1 : Both Fourier transform and inverse transform performed numerically
4. FFT2 : Fourier transform analytic, inverse transform numerical

FFT is performed in Python. File fft.py.

t = 200.031

$t = 400.031$

t = 800.031