

Q: write a python code using 2nd-order Runge-kutta to plot fidelity vs (time) curve.

(a) Given $H = \hbar \Omega \sigma_{x,1} \sigma_{x,2}$

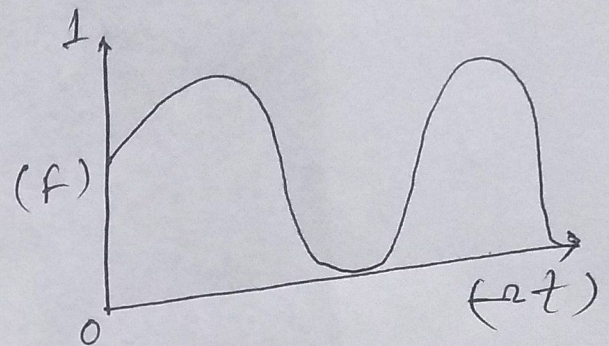
$$F = |\langle T | \psi(t) \rangle|^2$$

$$T = \frac{|00\rangle}{\sqrt{2}} - i \frac{|11\rangle}{\sqrt{2}}$$

$$\psi(t) = U | \psi(0) \rangle$$

$$| \psi(0) \rangle = | 00 \rangle$$

$$\begin{aligned} \dot{U} &= -\frac{i}{\hbar} \hat{H} \hat{U} \\ \frac{dU}{dt} &= -\frac{i}{\hbar} \hat{H} \hat{U} \\ \Omega t &= \frac{\pi}{4} \end{aligned}$$



(b) Given $H = \hbar \Omega \sigma_{x,1} \sigma_{x,2} + \hbar \epsilon (\sigma_{z,1} + \sigma_{z,2})$
and

$$H = \hbar \Omega \sigma_{x,1} \sigma_{x,2} + \hbar \epsilon (\sigma_{z,1} \sigma_{z,2})$$

