

Quiz 11- Solution

For $t > 0$ the eigenstates are $\psi_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ i \end{pmatrix}$ and $\psi_2 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ -i \end{pmatrix}$

$$\frac{1}{2} V \sigma_x \psi_1 = \frac{1}{2} V \psi_1, \quad \frac{1}{2} V \sigma_x \psi_2 = -\frac{1}{2} V \psi_2$$

For $t=0$ we have $\psi(t=0) = A\psi_1 + B\psi_2 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$; $A=B=\frac{1}{\sqrt{2}}$

$$\psi(t) = \frac{1}{\sqrt{2}} \psi_1 e^{-iVt/2\hbar} + \frac{1}{\sqrt{2}} \psi_2 e^{iVt/2\hbar}$$

$$= |t\rangle \cos \frac{Vt}{2\hbar} - i |b\rangle \sin \frac{Vt}{2\hbar}$$