

Physics 472 - 2020

Quantum Mechanics

Quiz 11

Please work for 10 minutes, take a picture, and e-mail it to me at dykmanm@msu.edu

Consider a spin with the wave functions $|\uparrow\rangle$ and $|\downarrow\rangle$ and assume that $\psi(t=0) = |\uparrow\rangle$. For $t < 0$ the Hamiltonian is

$$H_{<} = \frac{1}{2}\hbar\omega\sigma_z, \quad t < 0,$$

For $t > 0$ the Hamiltonian is

$$H_{>} = \frac{1}{2}V\sigma_x, \quad t > 0.$$

Find the time-dependent wave function for $t > 0$.

The Pauli matrices are

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, \quad \sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$