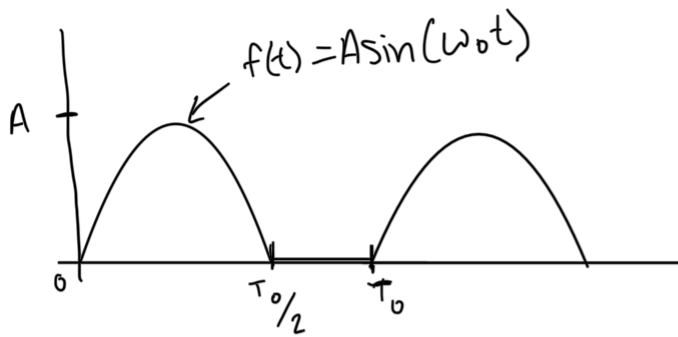


Fourier Activity



$$\frac{1}{\sqrt{T_0}} \rightarrow \sqrt{\frac{2}{T_0}} \rightarrow |f\rangle = C_0 |C_0\rangle + C_1 |C_1\rangle + C_2 |C_2\rangle$$

$$\omega_0 = \frac{2\pi}{T_0}$$
$$C_0 = \langle C_0 | f \rangle = \int_0^{T_0} C_0(t) f(t) dt = \frac{1}{\sqrt{T_0}} \int_0^{T_0} f(t) dt$$

$$\hookrightarrow \frac{1}{\sqrt{T_0}} \left[\int_0^{T_0/2} A \sin(\omega_0 t) dt + \int_{T_0/2}^{T_0} 0 dt \right] = \frac{1}{\sqrt{T_0}} A \left[-\frac{\cos(\omega_0 t)}{\omega_0} \right]_0^{T_0/2} = \frac{2A}{\sqrt{T_0}} \cdot \frac{T_0}{2\pi} = A \frac{\sqrt{T_0}}{\pi}$$

$$C_0 = \frac{A\sqrt{T_0}}{\pi}$$

$$C_1 = \langle C_1 | f \rangle = \int_0^{T_0/2} \sqrt{\frac{2}{T_0}} \cos(\omega_0 t) \cdot A \sin(\omega_0 t) dt$$

$$S_1 = \langle S_1 | f \rangle = \int_0^{T_0/2} \sqrt{\frac{2}{T_0}} \sin(\omega_0 t) \cdot A \sin(\omega_0 t) dt = \frac{1}{2} \cdot \sqrt{\frac{2}{T_0}} \cdot A \cdot \frac{T_0}{2}$$
$$= \frac{1}{4} \sqrt{T_0} \sqrt{2} A$$

$$\langle S_1 | f \rangle = \frac{A}{2} \sin(\omega_0 t)$$