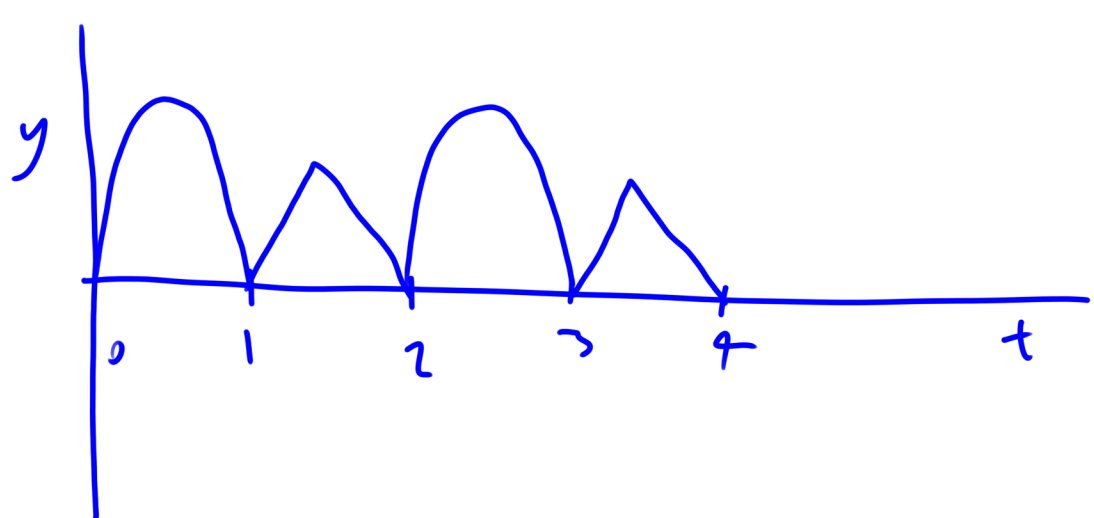


# Fourier Series Example



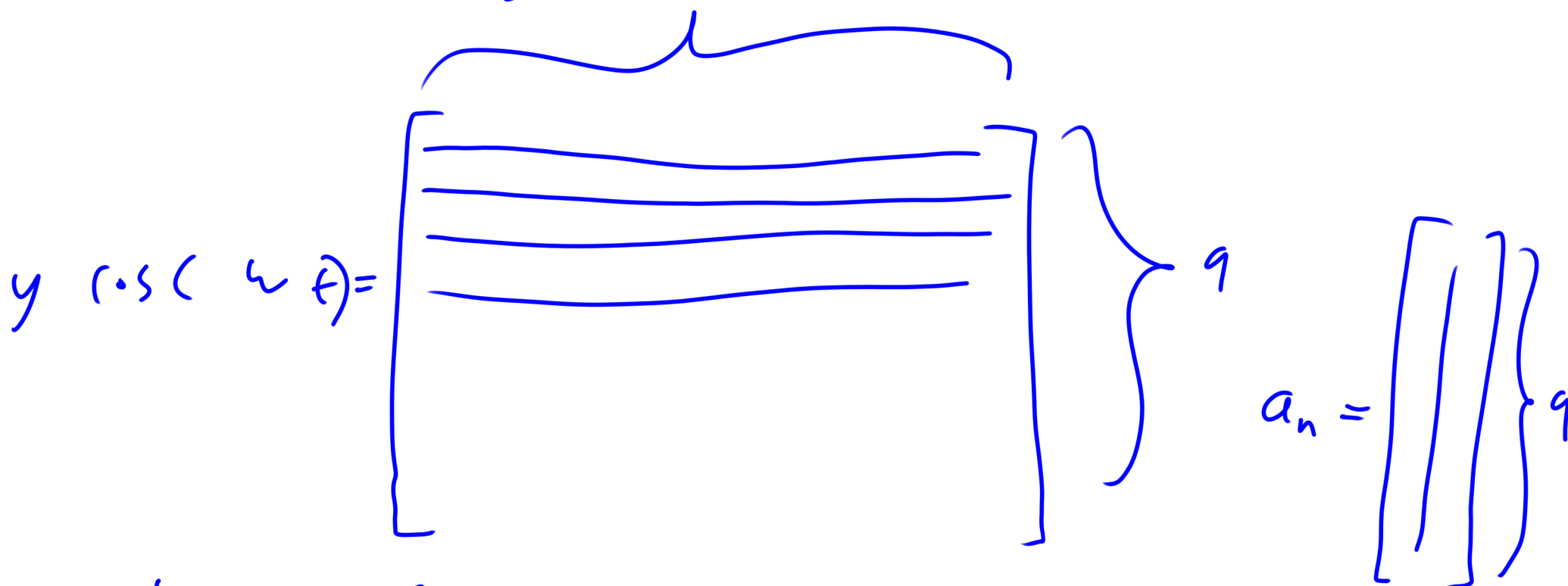
$$T=2$$

$$y = \left[ \text{---} \right] \} 1$$

$$w = \left[ \begin{array}{c} | \\ | \\ | \end{array} \right] \} 9$$

$$t = \left[ \text{---} \right] \} 800$$

$$a_n = \frac{2}{T} \int_{-\frac{T}{2}}^{\frac{T}{2}} y \cos(\omega t) dt$$



np. trapz function axis = 0

## Lowpass Filter

$$H(s) = \frac{1}{1 + s/\omega_0} \quad \omega_0 = 10$$

$$= \frac{\omega_0}{\omega_0 + s} = \frac{\omega_0}{\omega_0 + j\omega} \frac{\omega_0 - j\omega}{\omega_0 - j\omega}$$

$$= \frac{\omega_0^2 - \omega_0 \omega j}{\omega_0^2 + \omega^2}$$

$$|H(j\omega)| = \frac{\sqrt{\omega_0^4 + \omega_0^2 \omega^2}}{\omega_0^2 + \omega^2} = \frac{\omega_0 \sqrt{\omega_0^2 + \omega^2}}{\omega_0^2 + \omega^2}$$

$$= \frac{\omega_0}{\sqrt{\omega_0^2 + \omega^2}}$$

$$\angle H(j\omega) = a \tan\left(\frac{\omega_0 \omega}{\omega_0^2}\right)$$

$$= a \tan\left(\frac{\omega}{\omega_0}\right)$$

at  $\omega=0$

$$|H(j\omega)| = \frac{\omega_0}{\sqrt{\omega_0^2 + 0}} = \frac{\omega_0}{\omega_0} = 1$$

no need to change  $a_0$