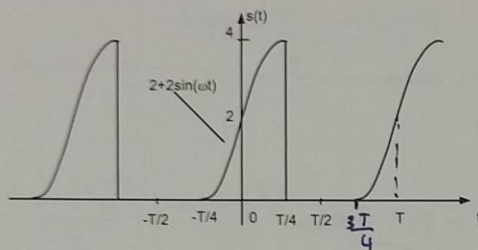


Geg.: periodischer Sinuspuls



$$\cos \alpha \cdot \cos \beta = \frac{1}{2} (\cos(\alpha + \beta) + \cos(\alpha - \beta))$$

$$\sin \alpha \cdot \sin \beta = \frac{1}{2} (\cos(\alpha - \beta) - \cos(\alpha + \beta))$$

$$\sin \alpha \cdot \cos \beta = \frac{1}{2} (\sin(\alpha + \beta) + \sin(\alpha - \beta))$$

Ges.: a_0, b_n, b_1, b_2, b_3

$$a_0 = \frac{2}{T} \cdot \int_{-T/4}^{T/4} (2 + 2 \sin(\omega t)) dt = \frac{2}{T} \cdot \left[t + \frac{-\cos(\omega t)}{\omega} \right]_{-T/4}^{T/4} =$$

$$= \frac{2}{T} \cdot \left[\frac{\cos(\frac{\pi}{2}) + \cos(-\frac{\pi}{2})}{\omega} \right] = \frac{2 \cdot 0}{2\pi} = 0$$

$$b_n = \frac{2}{T} \cdot \int_{-T/4}^{T/4} (2 + 2 \sin(\omega t)) \cdot \sin(n\omega t) dt = \frac{4}{T} \cdot \int_{-T/4}^{T/4} [\sin(n\omega t) + \sin(\omega t) \sin(n\omega t)] dt =$$

$$= \frac{4}{T} \cdot \int_{-T/4}^{T/4} \left[\sin(n\omega t) + \frac{1}{2} \cos(\omega t(1-n)) - \frac{1}{2} \cos(\omega t(1+n)) \right] dt =$$

$$= \frac{4}{T} \cdot \left[\left. \frac{-\cos(n\omega t)}{n\omega} \right|_{-T/4}^{T/4} + \left. \frac{\sin(\omega t(1-n))}{2\omega(1-n)} \right|_{-T/4}^{T/4} + \left. \frac{-\sin(\omega t(1+n))}{2\omega(1+n)} \right|_{-T/4}^{T/4} \right] =$$

$$= \frac{4}{T} \cdot \left[\frac{-\cos(\frac{\pi}{2}n) + \cos(-\frac{\pi}{2}n)}{n\omega} + \frac{\sin(\frac{\pi}{2}(1-n)) - \sin(-\frac{\pi}{2}(1-n))}{2\omega(1-n)} + \frac{-\sin(\frac{\pi}{2}(1+n)) + \sin(-\frac{\pi}{2}(1+n))}{2\omega(1+n)} \right] =$$

$$= \frac{4 \cdot 2 \cdot \sin(\frac{\pi}{2}(1-n))}{4\pi(1-n)} + \frac{-2 \cdot 4 \cdot \sin(\frac{\pi}{2}(1+n))}{4\pi(1+n)} = \underline{\underline{a_n b_n}} = \frac{2 \sin(\frac{\pi}{2} - \frac{\pi}{2}n)}{\pi - \pi n} - \frac{2 \sin(\frac{\pi}{2} + \frac{\pi}{2}n)}{\pi + \pi n}$$

1000

Subsraum

$$\underline{b_1} = \frac{2 \sin\left(\frac{\pi}{2}(1-n)\right)}{\pi(1-n)} - \overbrace{\left(\frac{2 \sin(\pi)}{2\pi}\right)}^0$$

$$b_1 = \lim_{n \rightarrow 1} \frac{\frac{2 \sin\left(\frac{\pi}{2}(1-n)\right) \cdot (-\pi)}{2}}{-\pi} = \frac{\frac{-2\pi}{2}}{-\pi} = \underline{1} \quad \checkmark$$

$$\underline{b_2} = \frac{2 \sin\left(-\frac{\pi}{2}\right)}{-\pi} - \frac{2 \sin\left(\frac{3\pi}{2}\right)}{3\pi} \approx 0,849 \quad \checkmark = \frac{-2}{-\pi} - \frac{-2}{3\pi}$$

$$\underline{b_3} = \frac{\overbrace{2 \sin(-\pi)}^0}{-2\pi} - \frac{\overbrace{2 \sin(2\pi)}^0}{4\pi} = \underline{0} \quad \checkmark$$

$$\underline{a_0} = \frac{1}{T} \cdot \int_{-\frac{T}{4}}^{\frac{T}{4}} (2 + 2 \sin(\omega t)) dt = \frac{2}{T} \cdot \left[t + \frac{-\cos(\omega t)}{\omega} \right]_{-\frac{T}{4}}^{\frac{T}{4}} = \frac{2}{T} \cdot \left[\left(\frac{T}{4} + \frac{-\cos\left(\frac{\pi}{2}\right)}{\omega} \right) - \left(-\frac{T}{4} + \frac{-\cos\left(-\frac{\pi}{2}\right)}{\omega} \right) \right]$$

$$= \frac{2}{T} \cdot \frac{2T}{4} = \underline{1} \quad \checkmark$$