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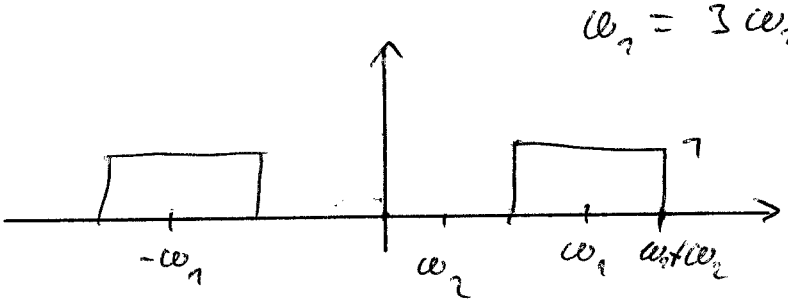
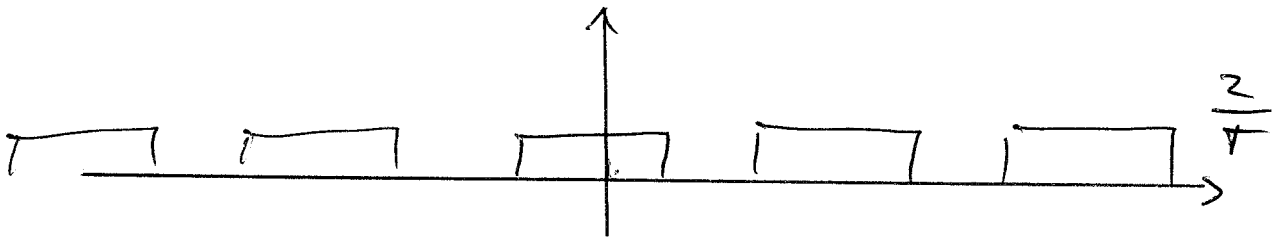
38.)





a.) $X(i\omega) = \underbrace{\text{rect}\left(\frac{\omega}{2\omega_2}\right)}_{X_1(i\omega)} * \underbrace{\left(\delta(\omega+\omega_1) + \delta(\omega_2-\omega_1)\right)}_{X_2(i\omega)}$

$X_2(i\omega) \circ\!\!-\!\!\bullet \frac{1}{\pi}\cos(\omega_1 t)$

$X_1(i\omega) \circ\!\!-\!\!\bullet \frac{\omega_2}{\pi}\,si(\omega_2 t)$

b.) $x(t) = \frac{\omega_2}{\pi}\,si(\omega_2 t)\cdot\frac{1}{\pi}\cos(\omega_1 t)\cdot 2\pi$

3.) (Klausur aufgabe)

c.) $y(t) = si(2\omega_0 t) \circ\!\!-\!\!\bullet \frac{\pi}{2\omega_0}\,\text{rect}\left(\frac{\omega}{4\omega_0}\right)$

$a(t) = si^2(\omega_0 t)$

Dualitätssatz

$t \mapsto \left(\frac{t}{T}\right) \circ\!\!-\!\!\bullet T\,si^2\left(\frac{\omega T}{2}\right)$ (aus Tabelle)

$$T \cdot si^2\left(\frac{\pi T}{2}\right) \circ\!\!-\!\!\bullet \; 2\pi \cdot \Lambda\left(\frac{\omega}{T}\right)$$

$\Rightarrow$ Ähnlichkeitssatz

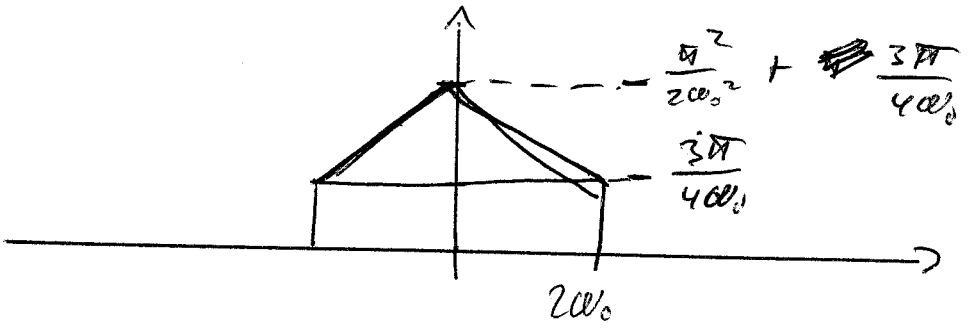
$$a = \frac{2}{T} \cdot 2\omega_0$$

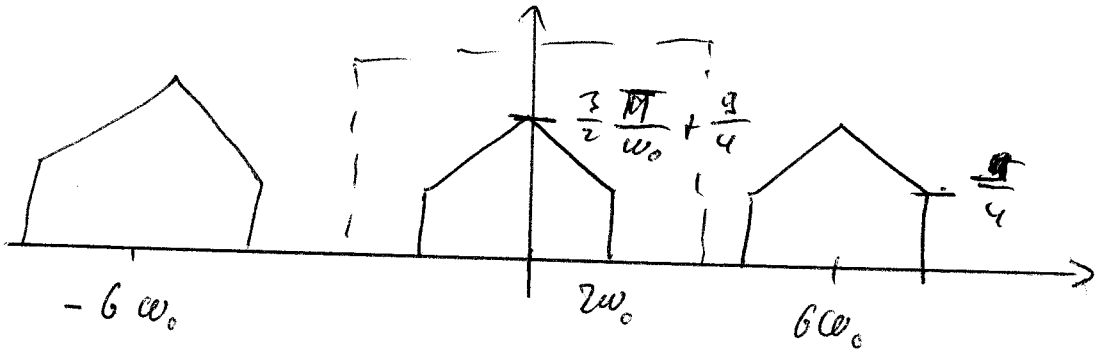
$$\Rightarrow si^2(\omega_0 t) \circ\!\!-\!\!\bullet \underbrace{\frac{\pi}{\omega_0} \Lambda\left(\frac{\omega}{2\omega_0}\right)}_{A(\omega)}$$

d.1)

$$S(\omega) = A(\omega) \cdot Y(\omega) + 0{,}5\, Y(\omega) + Y(\omega)$$

$$= \frac{\pi^2}{2\omega_0^2} \operatorname{rect}\left(\frac{\omega}{4\omega_0}\right) \cdot \Lambda\left(\frac{\omega}{2\omega_0}\right) + 1{,}5 \frac{\pi}{2\omega_0} \operatorname{rect}\left(\frac{\omega}{4\omega_0}\right)$$





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f.)

$$\frac{2\pi(1-\beta)}{2T_b} \geq 2\omega_0 \quad \text{untere Grenze}$$

$$\frac{2\pi(1+\beta)}{2T_b} \leq 4\omega_0 \quad \text{obere Grenze}$$

$$T_b = T_A = \frac{\pi}{3\omega_0}$$

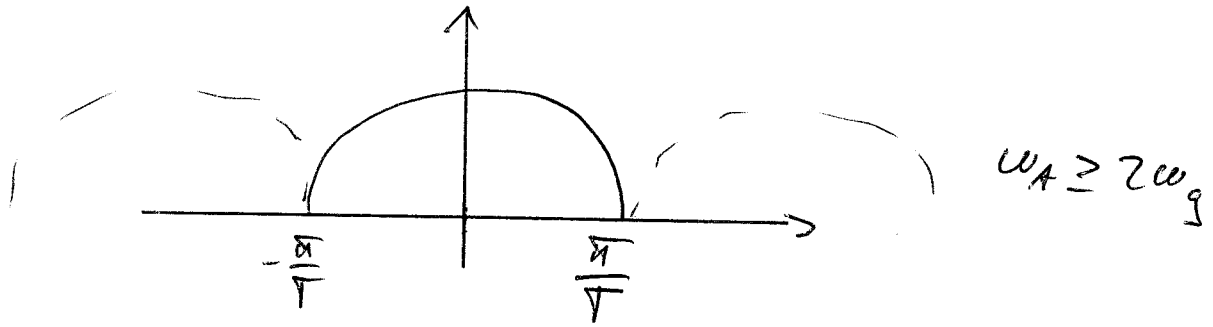
$$\Rightarrow \beta = \frac{1}{3}$$

---

a) $x^*(t) = \sum_{m=-\infty}^{\infty} u_k(mT)\,\delta(t-mT)$ AB Klausur 2.10.2003

$= u_k(t) \sum_{m=-\infty}^{\infty} \delta(t-mT)$

b.)



$\omega_A \geq 2\omega_g$

$$P(\omega) = T_A \cdot \text{rect}\left(\frac{\omega}{2\omega_g}\right)$$

$$X_k(\omega) = P(\omega) \cdot X_k^*(\omega)$$

$$x_k(t) = x_k^*(t) * \frac{2\pi}{\omega_A} \cdot \frac{\omega_A}{2\pi}\,\text{si}\left(\frac{\omega_A t}{2}\right)$$

$$= \sum_{k=-\infty}^{\infty} u_k(nT) \cdot si\left(\frac{\omega_0}{2}(t - nT)\right)$$

c.) $X(\omega) = X_0(\omega) * \mathcal{F}\{\cos(\omega_0 t)\}\frac{1}{2\pi}$

$$= \frac{1}{2} X_0(\omega) * (\delta(\omega - \omega_0) + \delta(\omega + \omega_0))$$

$$= \frac{1}{2}\left[X_0(\omega - \omega_0) + X_0(\omega + \omega_0)\right]$$

d.) $Y_{eo}(\omega) = \frac{1}{4}(\omega - 2\omega_0) + 2X_0(\omega) + X_0(\omega + 2\omega_0)$