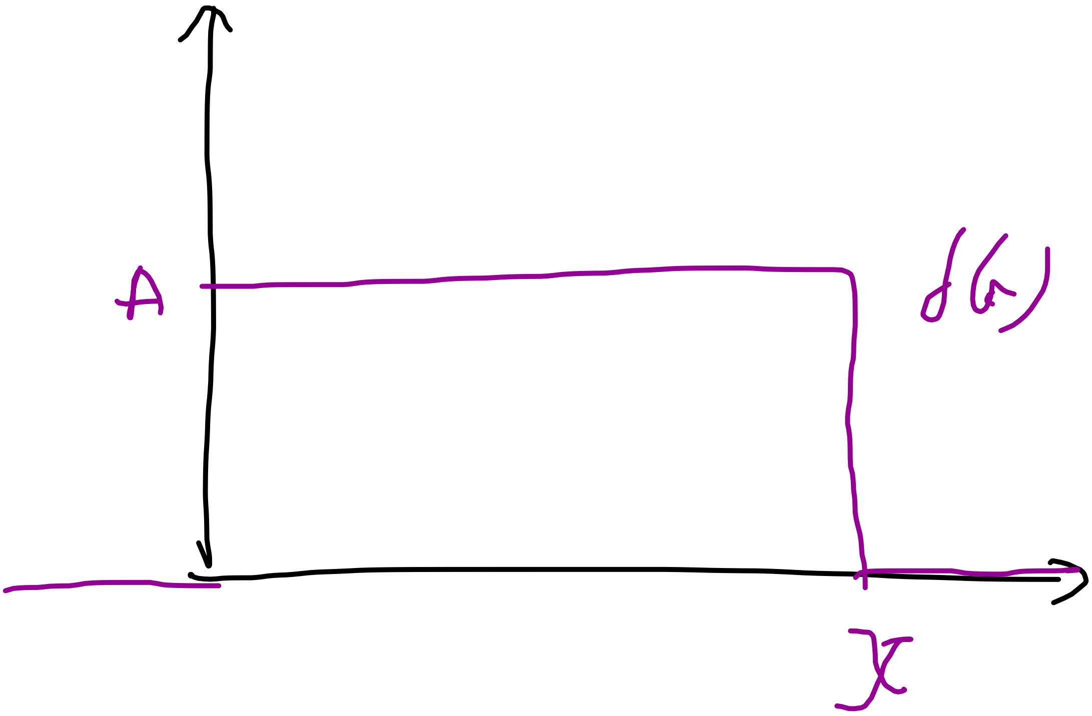


$$f(x) = \begin{cases} 0, & x < 0 \\ A, & 0 \le x < X \\ 0, & X < x \end{cases}$$

$g(x)$ - Signal

$g(x) * f(x)$

$\mathcal{F}[g * f] = \mathcal{F}[g] \cdot \mathcal{F}[f]$

$$\hat{f}(\omega) \triangleq \mathcal{F}[f(x)](\omega)$$

$$\triangleq F(\omega) =$$

$$= \int_{-\infty}^{+\infty} f(x)\, e^{-2\pi i \omega x}\, d_x =$$

$$= \int 0 + \int_0^x \quad + \int 0 =$$

$$= \int_0^X A e^{-i2\pi\omega x}\, dx =$$

$$= \frac{1}{-2\pi i\omega} \cdot A \int_0^X e^{-i2\pi\omega x}\, d(-i2\pi\omega x)$$

$$= \frac{A}{-2\pi i\omega} \int_0^{-2\pi i X\omega} e^{u}\, du =$$

$$= \frac{-A}{2\pi i\omega} e^{u} \Big|_0^{-2\pi i X\omega} =$$

$$= \frac{-A}{2\pi i \omega}\left(e^{-2\pi i \omega x} - 1\right) =$$

$$= \frac{-A}{2\pi i \omega} e^{-\pi i \omega x}\left(e^{-\pi i \omega x} - e^{\pi i \omega x}\right)$$

$$= \frac{\cancel{+}A}{\cancel{2}\pi \cancel{i} \omega} e^{-\pi i \omega x}\left(\cancel{-2i} \sin\left(\pi \omega x\right)\right) =$$

$$= \frac{A}{\pi \omega} e^{-\pi i \omega x} \sin\left(\pi \omega x\right)$$

$\Downarrow$

Für Fourier – Spektrum

$$|F(\omega)| = \left| \frac{A}{\pi\omega} \cdot e^{-\pi i \omega x} \cdot \sin(\pi\omega) \right|$$

$$= \left|\frac{A}{\pi\omega}\right| \left|\sin(\pi\omega x)\right| \underbrace{\left|e^{-\pi i \omega x}\right|}_{=1}$$

$$\left| e^{i\lambda} \right| \quad (\lambda = -t\omega)$$

$$e^{i\lambda} = z$$

$$z = |z|(\cos\lambda + i\sin\lambda) =$$

$$z = |z|(\cos\lambda + i\sin\lambda)$$

$$\mathrm{Re}\, z = \cos\lambda$$

$$\mathrm{Im}\, z = \sin\lambda$$

$$|z| = \sqrt{\mathrm{Re}^2 z + \mathrm{Im}^2 z} =$$

$$= \sqrt{\cos^2\theta + \sin^2\theta} =$$

$$= \sqrt{1} = 1$$

$$\left| e^{i\theta} \right| = 1 \quad \forall \theta,$$

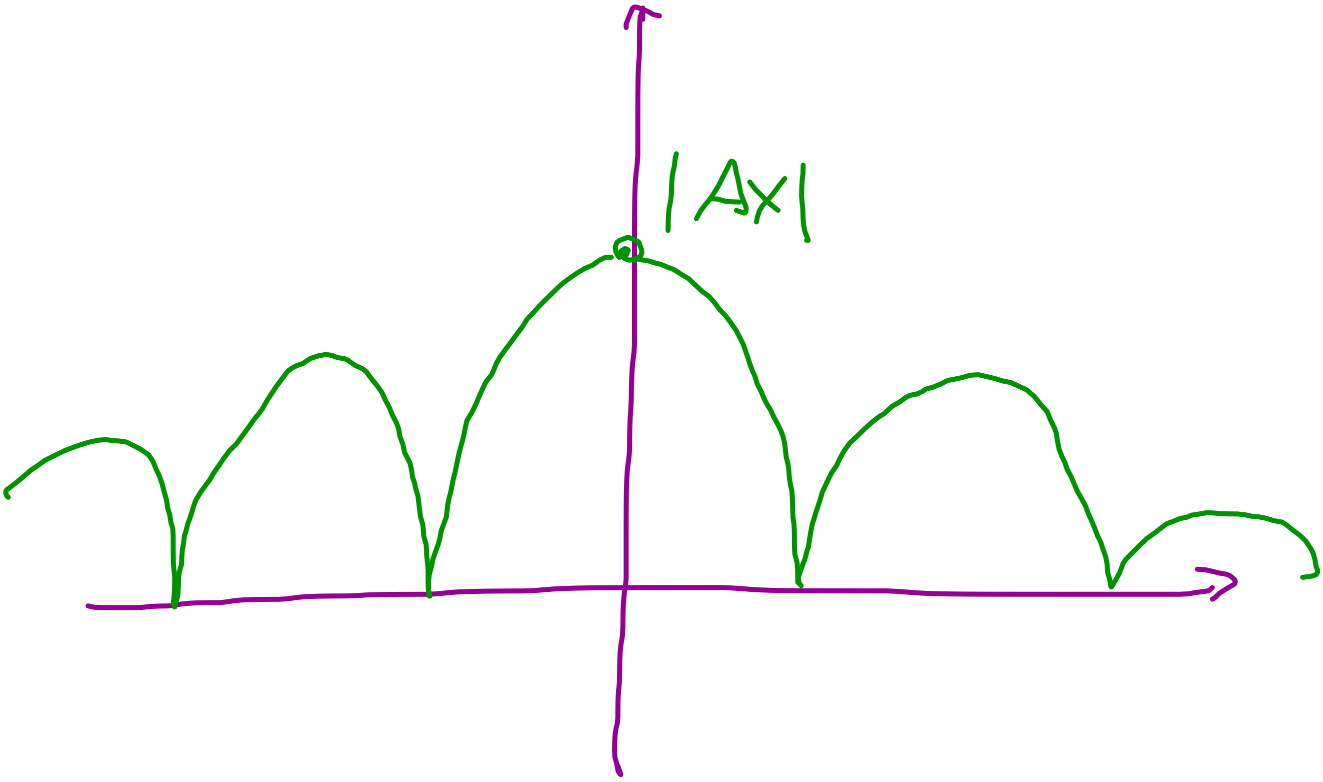
also equal for

$\theta = -\pi$ or π

$$|F(\omega)| = \left|\frac{A}{\pi\omega}\sin(\omega X \pi)\right|$$

$$= |AX| \left|\frac{\sin(\omega \pi X)}{\pi\omega X}\right| =$$

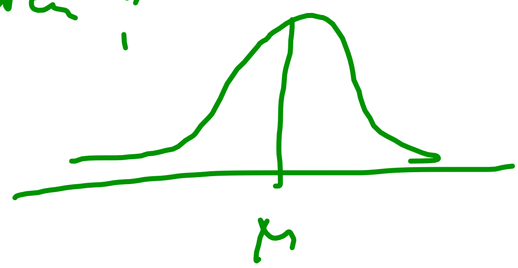
$$= |AX| \, |\mathrm{sinc}\,(\omega X \pi)|$$



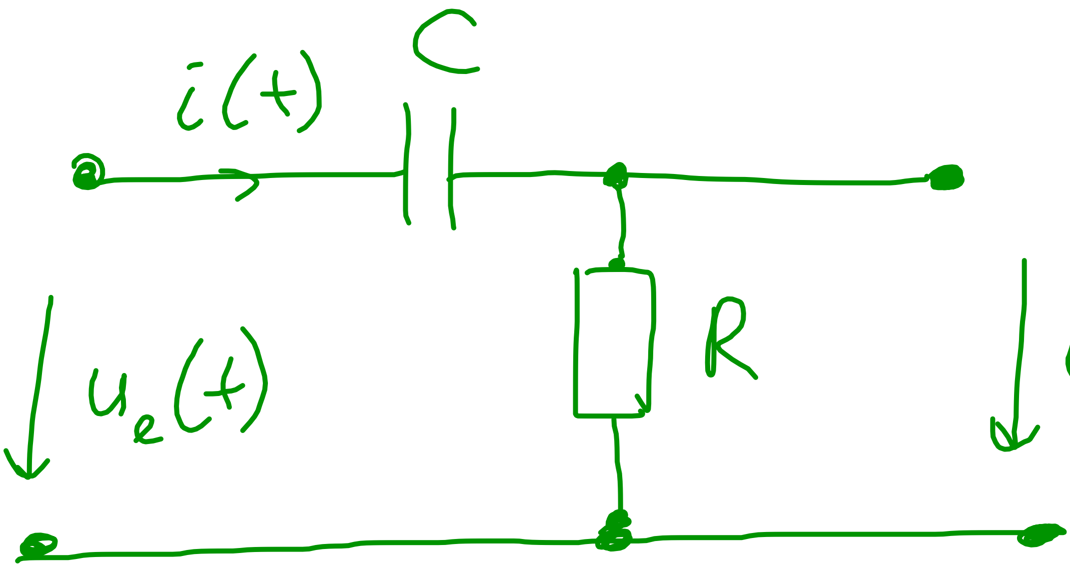
HA: $e^{-\frac{\pi x^2}{\sigma^2}} = e^{-\frac{\pi \mu}{\sigma^2}}$

zu transformieren!

Gauß-Glocke



Hochpaß 1. Ordnung



$$u_a(t) = u_R(t)$$

$$(1) \quad u_e(t) = u_c(t) + u_R(t)$$

$$(2) \quad i(t) = C \frac{du_c(t)}{dt}$$

$$(3) \quad u_R(t) = i(t)\, R$$

$$(1) \Rightarrow \quad \dot{u}_e(t) = \underline{\underline{\dot{u}_c(t)}} + \dot{u}_R(t)$$

$$(2)$$

$$\dot{u}_e(t) = \frac{i(t)}{C} + \dot{u}_R(t)$$

(3) $\Rightarrow$

$$\dot{u}_e = \frac{u_R}{RC} + \dot{u}_R \, ;$$

DGL: $\Big\downarrow$ FT

$$u_R(t) \bullet\!\!-\!\!\!-\!\!\circ \; Y(\omega)$$

$$u_e(t) \bullet\!\!-\!\!\!-\!\!\circ \; X(\omega)$$

Mit Ableitungsregel:

$$f(t) \bullet\!\!-\!\!\circ \; F(\omega) \Rightarrow f^{(n)}(t) \bullet\!\!-\!\!\circ \; (j\omega)^n F(\omega)$$

$$(j\omega)X(\omega) = \frac{1}{RC}Y(\omega) + (j\omega)Y(\omega) =$$

$$= \frac{1 + RCj\omega}{RC} Y(\omega);$$

$$Y(\omega) = \frac{j\omega RC}{1 + j\omega RC} \cdot X(\omega)$$

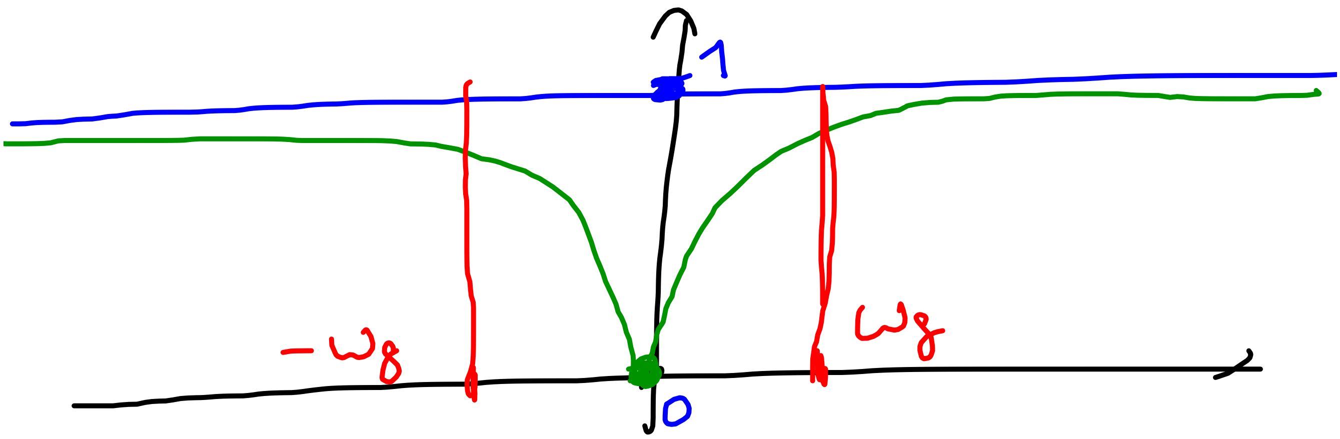
$$G(\omega) = \frac{j\omega RC}{1 + j\omega RC}$$

Übertragungsfunktion

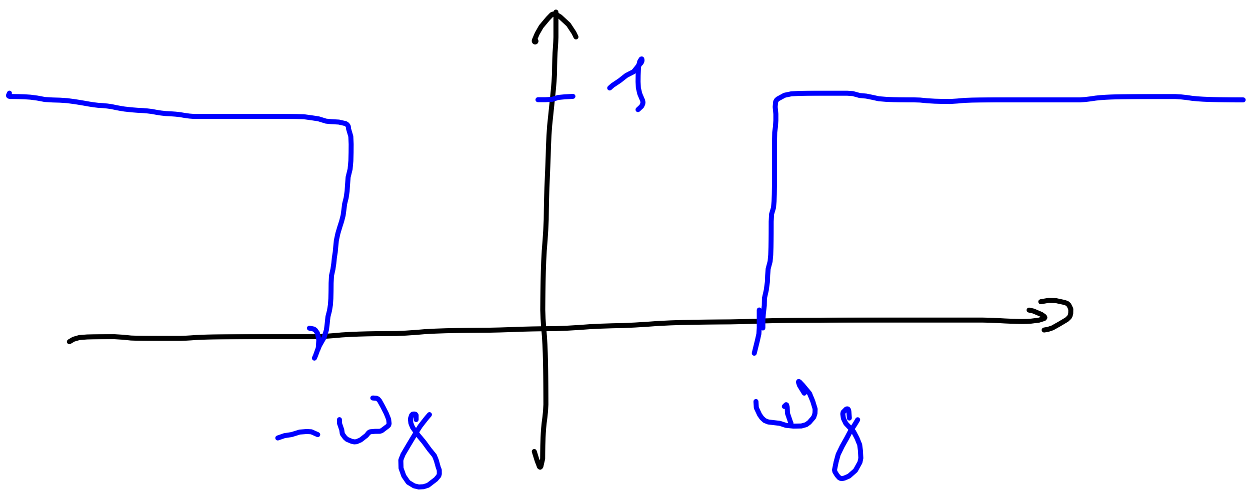
$$|G(\omega)| - ?$$

$$|G(\omega)| = \frac{RC\,|\omega|}{|1 + RCj\omega|} =$$

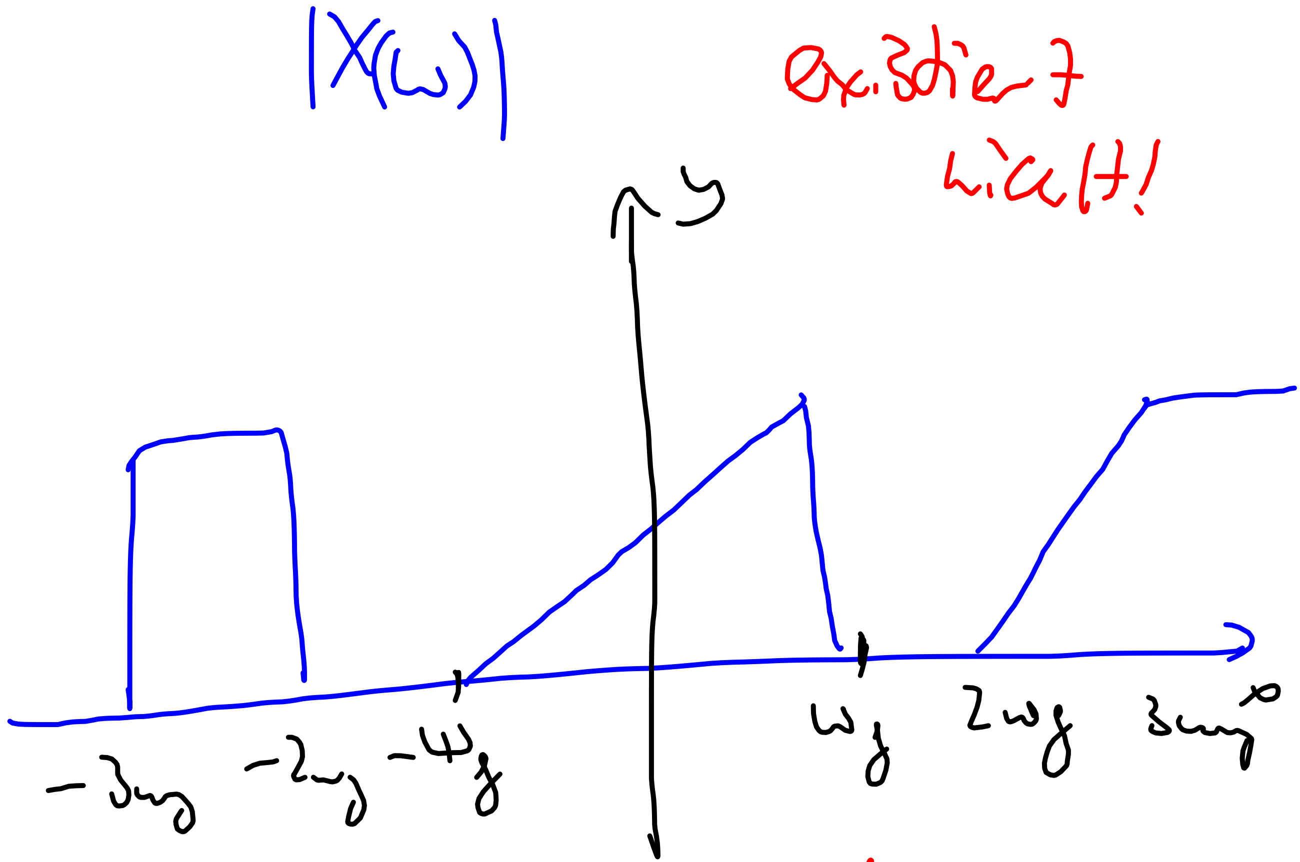
$$= \frac{RC\,|\omega|}{\sqrt{1 + (CR\omega)^2}}$$



Oder idealisiert:



existiert nicht!



immer symmetrisch!

$$Y(\omega) = G(\omega) \cdot X(\omega)$$