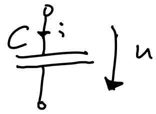
(114)



$$C = \frac{Q}{u} \longrightarrow Cu = Q$$

$$\xrightarrow{\frac{d}{dt}} Cu' = Q' = i$$

$$\xrightarrow{\mathcal{L}(\dots)} CsU = I$$

Transferfkt.: $\longrightarrow \underline{G(s)} = \frac{I}{U} = \underline{Cs}$

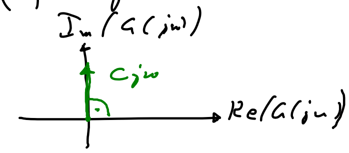
Frequenzantwort: $\underline{u(t) = G(j\omega)e^{j\omega t}}$ (ist Antwort auf Eingang $e^{j\omega t}$)

(für grosse t)

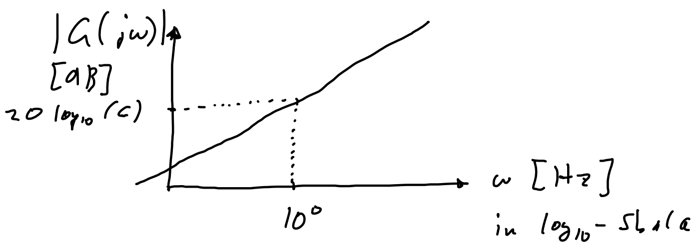
I.e. $u(t) = G(j\omega)e^{j\omega t} = Cj\omega e^{j\omega}$

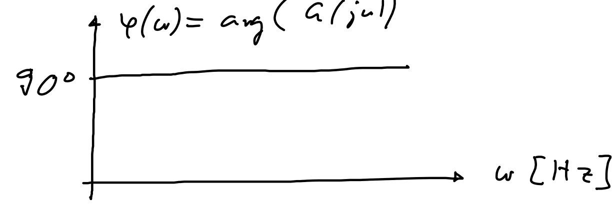
→ Verstärkung: $|G(j\omega)| = C\omega$

Phase: $\arg(G(j\omega)) = \arg(Cj\omega) = \frac{\pi}{2} = 90°$

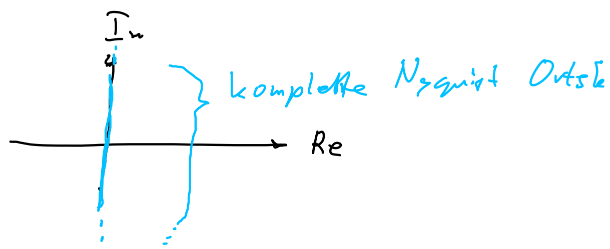


Bode: $20\log_{10}(|G(j\omega)|) = 20\log_{10}(C\omega) = 20(\log_{10}(C) + \log_{10}(\omega))$





Nyquist: $\underline{G(j\omega) = Cj\omega}$



(85) (iv) $\frac{2s+6}{s^2+4}$

[Erinnerung: PBZ bei konj. kompl. NS $x_1, \overline{x_1}$ (siehe S. 102 im Skript)

$$\frac{A + Bx}{x^2 + px + q}$$

wobei $x^2 + px + q = (x - x_1)(x - \overline{x_1})$

→ dieses Polynom nicht in Lin.-Fakt. zerlegen!]

→ Rücktrafo direkt mit $\sin(\dots)$, $\cos(\dots)$:

$$\frac{2s+6}{s^2+4} = \frac{1}{4}\cdot\frac{2s+6}{\left(\frac{s}{2}\right)^2+1} = \frac{1}{4}\left(\frac{2s}{\left(\frac{s}{2}\right)^2+1} + \frac{6}{\left(\frac{s}{2}\right)^2+1}\right)$$

$$\begin{array}{ccc} 4\cos(t) & \xrightarrow{\mathcal{L}} & \frac{4s}{s^2+1} \\ \downarrow & & \downarrow \; s \mapsto \frac{s}{2};\dots \\ 4\cos(2t) & \xrightarrow{\mathcal{L}} & \frac{s}{\left(\frac{s}{2}\right)^2+1} \end{array}$$

$$\to \underline{\mathcal{L}^{-1}\left(\frac{2s+6}{s^2+4}\right)}$$

$$= \underline{2\cos(2t) + 3\sin(2t)}$$

$$\begin{array}{ccc} 2\sin(t) & \xrightarrow{\mathcal{L}} & \dfrac{2}{s^2+1} \\ \downarrow & & \downarrow \; s \mapsto \frac{s}{2} ; \ldots \\ 2\sin(2t) & \xrightarrow{\mathcal{L}} & \dfrac{1}{(\frac{s}{2})^2+1} \end{array}$$

(viii) $$\frac{4s}{(s-1)(s+1)^2} = \frac{A}{s-1} + \frac{B}{s+1} + \frac{C}{(s+1)^2}$$

$\longrightarrow \quad 4s = A(s+1)^2 + B(s+1)(s-1) + C(s-1)$

$\longrightarrow \quad A, B, C.$

34 (iv) $y'' - y' - 2y = 10\cos(x) \quad (*)$

<u>Hom. Gl.:</u> $\quad y'' - y' - 2y = 0$

$\lambda^2 - \lambda - 2 = 0 \longrightarrow \lambda_\pm = \dfrac{1 \pm \sqrt{1+8}}{2} = \frac{1}{2} \pm \frac{3}{2}$

$\longrightarrow \underline{\lambda_+ = 2}$

$\underline{\lambda_- = -1}$

$\longrightarrow \underline{y_h(x) = C_1 e^{2x} + C_2 e^{-x}}$

<u>Inhom. Gl.:</u> Ansatz: $y_i(x) = A\cos(x) + B\sin(x)$

(siehe S. 21)

in $(*)$: $-A\cos(x) - B\sin(x) + A\sin(x) - B\cos(x) - 2A\cos(x) - 2B\sin(x)$

$= 10\cos(x)$

$\longrightarrow A, B, C \longrightarrow \ldots$