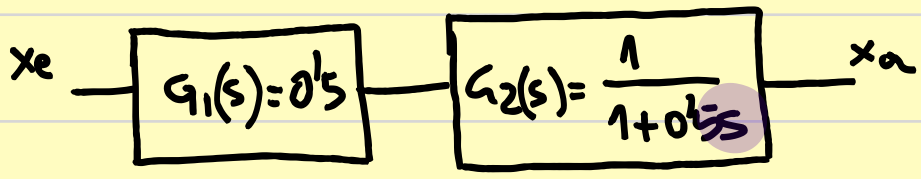
Bodediagramm

$$\log(a \cdot b) = \log a + \log b$$

Deshalb darf ich sie addieren!

1. 

- $G_1(j\omega) = 0'5 \rightarrow |G_1(j\omega)| = 0'5 \; ; \angle G_1(j\omega) = 0° = \arctan \frac{Im}{Re}$

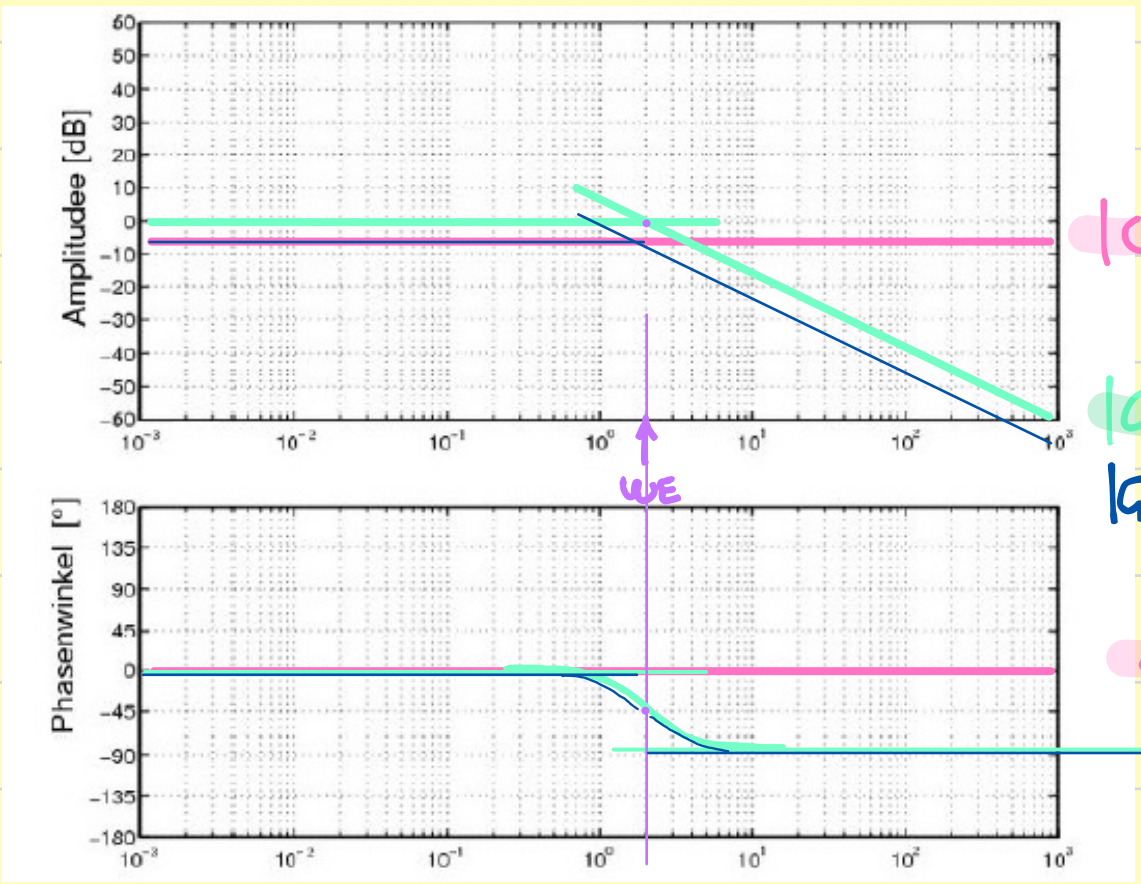
$$|G_1(j\omega)|_{dB} = 20 \log |G_1(j\omega)| = -6'02\,dB$$

- $$G_2(j\omega) = \frac{1}{1+0'5j\omega} \cdot \frac{1-0'5j\omega}{1-0'5j\omega} = \frac{1}{1^2+0'5^2\omega^2}(1-0'5j\omega)$$

$$|G_2(j\omega)| = \sqrt{Re^2+Im^2} = \frac{1}{1+0'25\omega^2} \cdot \sqrt{1^2+0'25\omega^2} = \frac{1}{\sqrt{1^2+0'25\omega^2}} = (1+0'25\omega^2)^{-1/2}$$

$$|G_2(j\omega)|_{dB} = 20 \cdot \log|G_2(j\omega)| = 20 \cdot \frac{-1}{2} \cdot \log(1+0'25\omega^2) = -10 \log(1+0'25\omega^2)$$

$$\angle G_2(j\omega) = \arctan \frac{Im}{Re} = \arctan \frac{-0'5\omega}{1}$$



$|G_1(j\omega)|_{dB}$

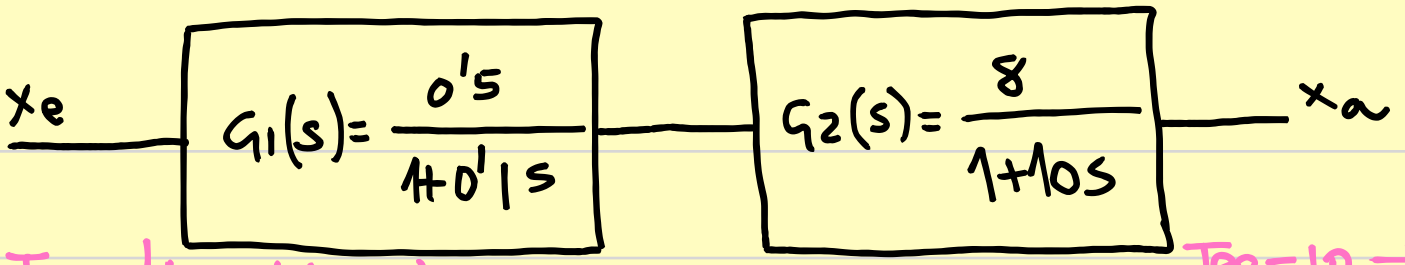
$|G_2(j\omega)|_{dB}$ $\omega_E = \frac{1}{T_e} = \frac{1}{0'5}$

$|G(j\omega)|_{dB} = |G_1(j\omega)|_{dB} + |G_2(j\omega)|_{dB}$

$\angle G_1(j\omega)$

$\angle G_2(j\omega) = \angle G(j\omega)$

2.



$T_{e1}=0'1 \rightarrow \omega_{E1}=10$ $\quad$ $T_{e2}=10 \rightarrow \omega_{E2}=0'1$

$$G_1(j\omega)=\frac{0'5}{1+0'1j\omega}\cdot\frac{1-0'1j\omega}{1-0'1j\omega}=0'5\cdot\frac{1-0'1j\omega}{1^2+0'01\omega^2}$$

$$|G_1(j\omega)|=0'5\sqrt{Re^2+Im^2}=\frac{0'5}{1+0'01\omega^2}\sqrt{1+0'01\omega^2}=\frac{0'5}{\sqrt{1+0'01\omega^2}}=0'5\left(1+0'01\omega^2\right)^{-1/2}$$

$$\angle G_1(j\omega)=\arctan\frac{Im}{Re}=\arctan\frac{-0'1\omega}{1}$$

$$|G_1(j\omega)|_{dB}=20\log|G_1(j\omega)|=20\cdot\left[\log 0'5-\frac{1}{2}\log\left(1+0'01\omega^2\right)\right]$$ (•)

$$G_2(j\omega)=\frac{8}{1+10j\omega}\cdot\frac{1-10j\omega}{1-10j\omega}=8\cdot\frac{1-10j\omega}{1^2+10^2\omega^2}=\frac{8}{1+10^2\omega^2}\left(1-10j\omega\right)$$

$$|G_2(j\omega)|=\frac{8}{1+10^2\omega^2}\sqrt{1+10^2\omega^2}=8\left(1+10^2\omega^2\right)^{-1/2}$$

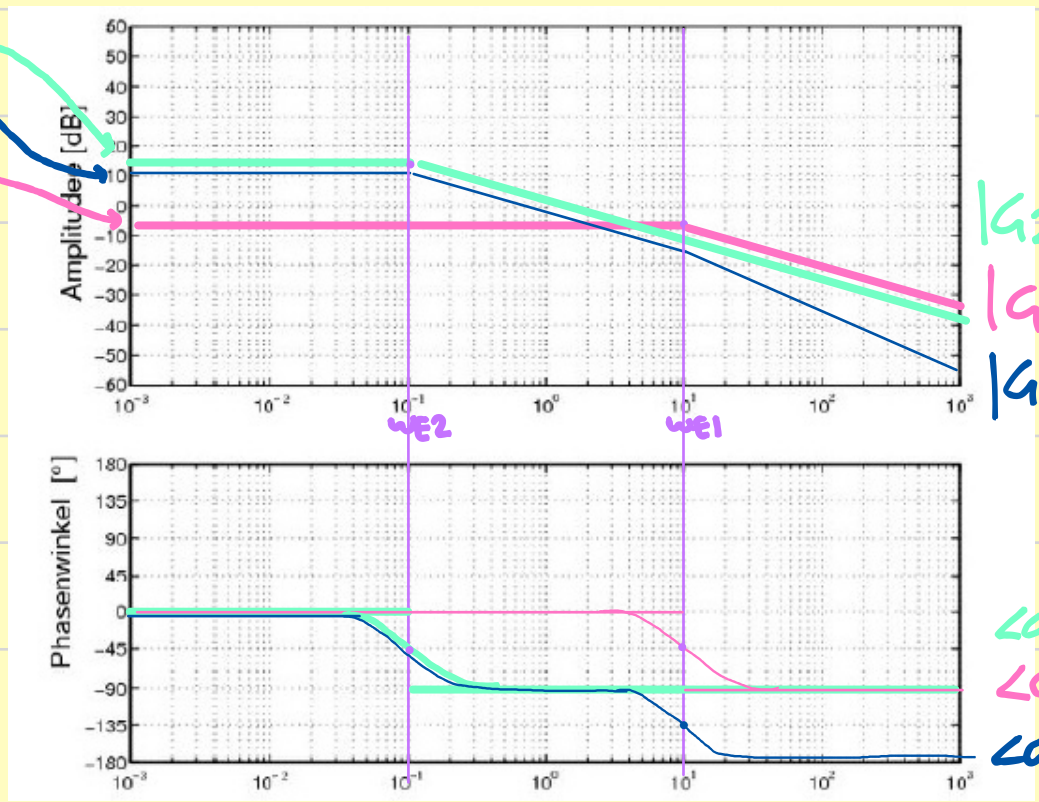
$$\angle G_2(j\omega)=\arctan\frac{-10\omega}{1}$$

$$|G_2(j\omega)|_{dB}=20\log|G_2(j\omega)|=20\left[\log 8-\frac{1}{2}\log\left(1+10^2\omega^2\right)\right]$$ (•)

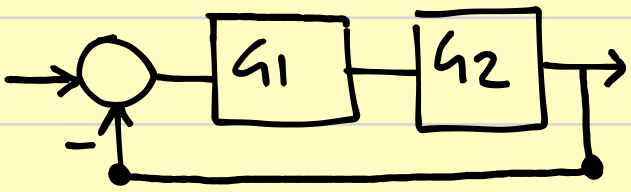
(•) $+18'06dB$

(•) $12'04dB$

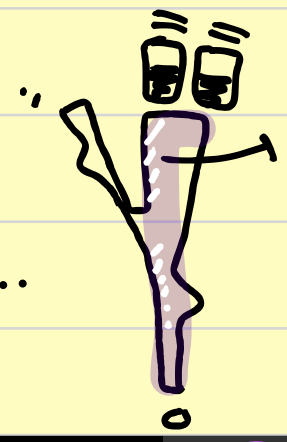
$-6'02dB$



3. Wie ändert jeweils das Bode-Diagramm, wenn ich einen Regelkreis einfüge?



$$G(s) = \frac{G_1 G_2}{1 + G_1 G_2} \quad \ldots$$



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