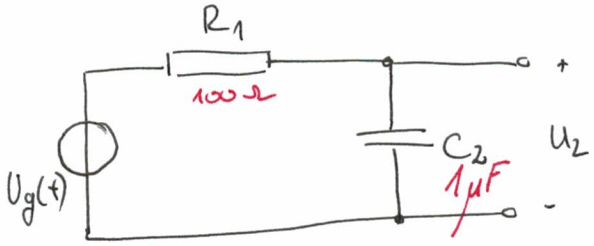


$U_g(t) = 10V \cdot \sin(\omega t)$

$f = 1\,kHz$

U_2 ; $H(j\omega)$, $|H(j\omega)|$

$$H(j\omega) = \frac{U_2(j\omega)}{U_1(j\omega)} = \frac{I(j\omega)\cdot\frac{1}{j\omega C_2}}{I(j\omega)\cdot\left(R_1+\frac{1}{j\omega C_2}\right)} = \frac{1}{1+j\omega R_1 C_2}$$

$$= \boxed{\frac{1-j\omega R_1 C_2}{1+(\omega R_1 C_2)^2}}$$

$$|H(j\omega)| = \sqrt{\left(\frac{1}{1+(\omega R_1 C_2)^2}\right)^2 + \left(\frac{-j\omega R_1 C_2}{1+(\omega R_1 C_2)^2}\right)^2}$$

$$= \sqrt{\frac{1+(\omega R_1 C_2)^2\,1}{\left(1+(\omega R_1 C_2)^2\right)^2}} = \boxed{\frac{1}{\sqrt{1+(\omega R_1 C_2)^2}}}$$

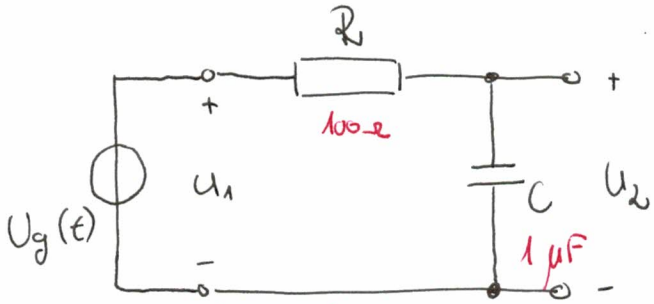
$$\text{arctg} = \frac{\mathrm{Im}\{H(j\omega)\}}{\mathrm{Re}\{H(j\omega)\}} = \frac{\frac{-j\omega R_1 C_2}{1+(\omega R_1 C_2)^2}}{\frac{1}{1+(\omega R_1 C_2)^2}} = -j\omega R_1 C_2$$

$$\Rightarrow -\text{arctg}(\omega R_1 C_2) = \boxed{-\text{arctg}(2\pi f R_1 C_2)}$$

$\omega = 2\pi f$ $\qquad \omega_1 = \frac{1}{R_1 C_2} = \boxed{1\cdot 10^4 \left[\frac{rad}{s}\right]}$

$f_1 = \frac{\omega_1}{2\pi} = \frac{1\cdot 10^4}{2\pi} = \boxed{1591{,}55\ Hz}$

pri ω_1



$u_g(t) = 10V \cdot \sin(\omega t)$

$f = 1\,kHz$

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u_2

$H(j\omega)$ $\qquad H(j\omega) = \dfrac{u_2(j\omega)}{u_1(j\omega)}$

$|H(j\omega)|$

$$\frac{u_2(j\omega)}{u_1(j\omega)} = \frac{I(j\omega)\cdot\frac{1}{j\omega C}}{I(j\omega)\cdot\left(R+\frac{1}{j\omega C}\right)} = \frac{\frac{1}{j\omega C}}{\frac{j\omega RC+1}{j\omega C}} = \frac{1}{j\omega RC+1} = \boxed{\frac{1-j\omega RC}{1+(\omega RC)^2}}$$

$$|H(j\omega)| = \sqrt{Im^2\{H(j\omega)\} + Re^2\{H(j\omega)\}}$$

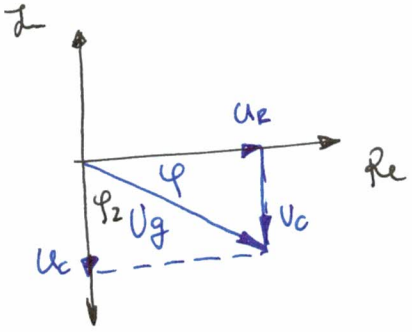
$$= \sqrt{\left(\frac{1}{1+(\omega RC)^2}\right)^2 + \left(\frac{-j\omega RC}{1+(\omega RC)^2}\right)^2} = \sqrt{\frac{1+(\omega RC)^2}{(1+(\omega RC)^2)^2}} = \frac{1}{\sqrt{1+(\omega RC)^2}}$$

$$\frac{1}{RC} = \omega_1$$

$$= \boxed{\frac{1}{\sqrt{1+\left(\frac{\omega}{\omega_1}\right)^2}}}$$

$$\varphi = \operatorname{arctg}\frac{Im\{H(j\omega)\}}{Re\{H(j\omega)\}} = \operatorname{arctg}\frac{\frac{-j\omega RC}{1+(\omega RC)^2}}{\frac{1}{1+(\omega RC)^2}} = \operatorname{arctg}(-j\omega RC) = \boxed{-\operatorname{arctg}(\omega RC)}$$

$$\omega = 2\pi f = 2\pi \cdot 1000\,Hz = \boxed{6283{,}185\ \frac{rad}{s}}$$

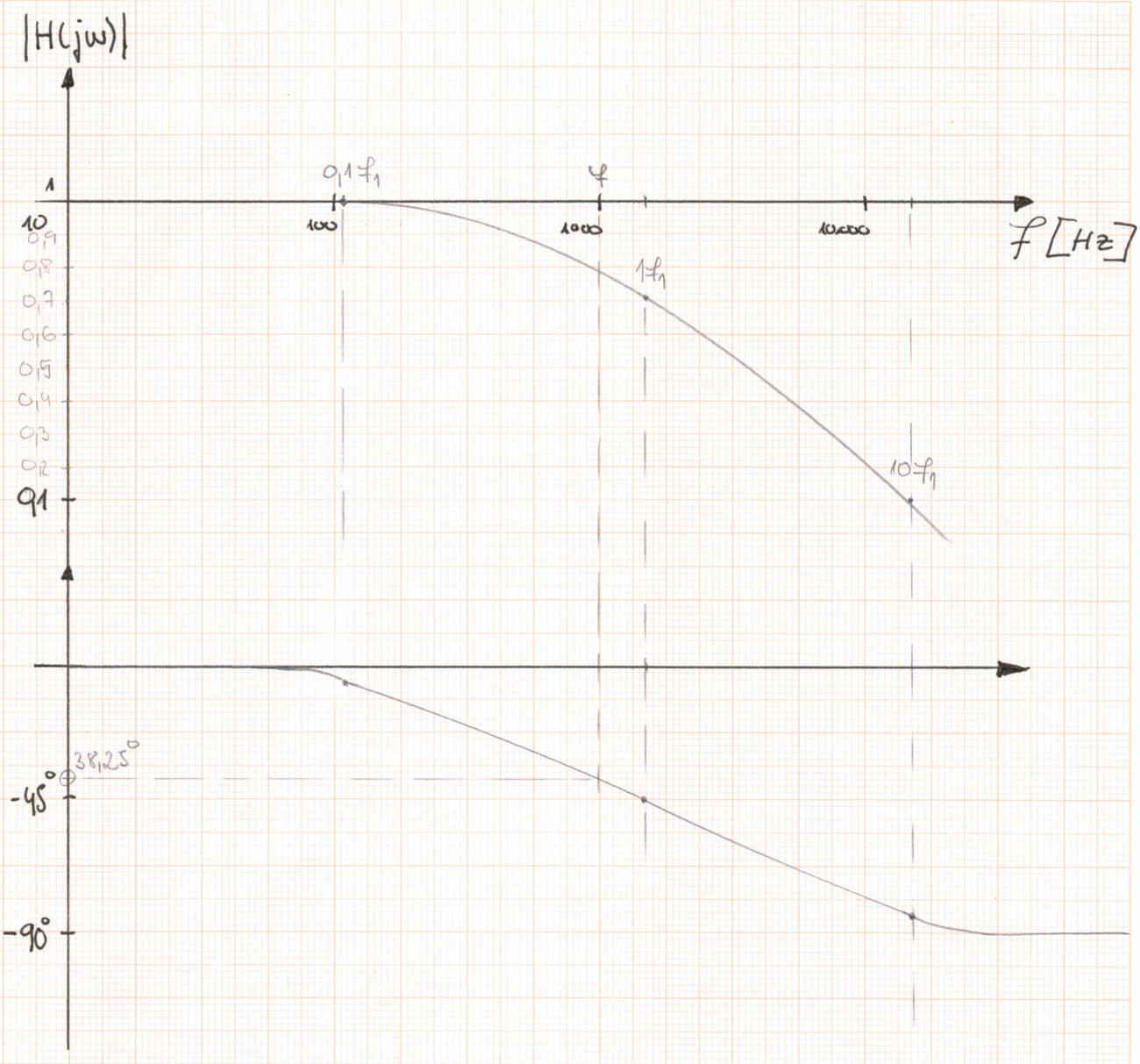


$$u_L = u_C = \sin\varphi_2 \cdot U_g$$

$$\varphi = -\operatorname{arctg}(\omega RC) = \boxed{-32{,}14^\circ}$$

$$\varphi_2 = 90^\circ - \varphi = \boxed{57{,}86^\circ}$$

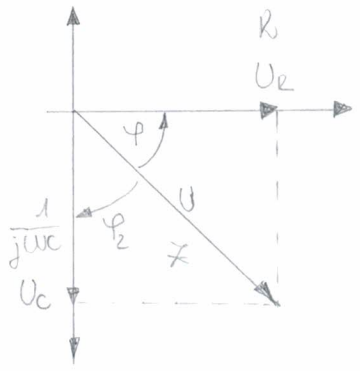
$$u_L = \underbrace{-\sin\varphi}_{0{,}532} \cdot U_g = \boxed{5{,}32V \cdot \sin(\omega t)}$$



$\frac{f}{f_1} = \frac{\omega}{\omega_1}$	$\lvert H(j\omega)\rvert$	$-\operatorname{arctg}\left(\frac{\omega}{\omega_1}\right)$
$f = 0{,}1 f_1$	0,1	0,995	$-5{,}71°$
$f = f_1$	1	0,707	$-45°$
$f = 10 f_1$	10	0,099	$-84{,}35°$

$$|H(j\omega)| = \frac{1}{\sqrt{1+(\omega RC)^2}} = \frac{1}{\sqrt{1+\left(\frac{\omega}{\omega_1}\right)^2}}$$

$$X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C} = \frac{1}{2\pi \cdot 1000\,Hz \cdot 1 \cdot 10^{-6}\,F} = \boxed{159{,}16\,\Omega}$$



$$U_2 = U_C$$

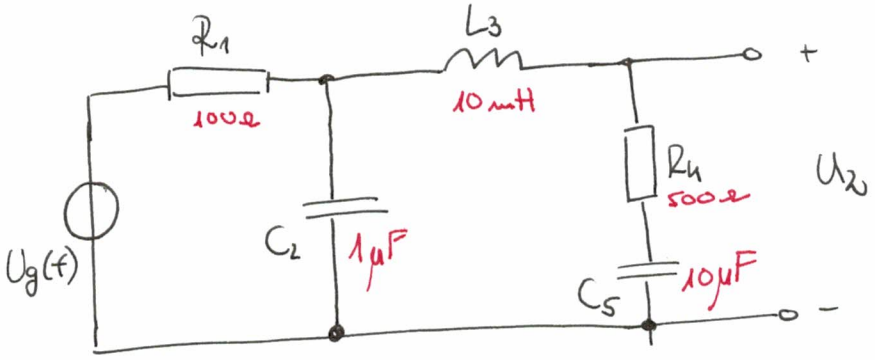
$$\varphi = \operatorname{arctg}\left(\frac{\frac{1}{j\omega C}}{R_1}\right) = \operatorname{arctg}\left(\frac{159{,}16\,\Omega}{100\,\Omega}\right)$$

$$= 57{,}86°$$

$$\varphi_2 = 90 - \varphi = \boxed{32{,}14°}$$

$$U_2 = U_C = \underbrace{\sin \varphi_2}_{0{,}53} \cdot U_g \qquad U_g(t) = 10V \cdot \sin(\omega t)$$

$$\boxed{U_2(t) = 5{,}32 \cdot \sin(\omega t)\ V}$$



$U_g(t) = 10V \cdot \sin(2\pi \, 1kHz \cdot t)$

$H(j\omega), \; |H(j\omega)|, \; \varphi$

$$H(j\omega) = \frac{U_2(j\omega)}{U_g(j\omega)}$$

$$U_2(j\omega) = \frac{U_g(j\omega) \cdot \frac{1}{j\omega C_2} \,\|\, \left(j\omega L_3 + R_4 + \frac{1}{j\omega C_5}\right) \cdot \left(R_4 + \frac{1}{j\omega C_5}\right)}{\left(R_1 + \frac{1}{j\omega C_2} \,\|\, \left(j\omega L_3 + R_4 + \frac{1}{j\omega C_5}\right)\right) \cdot \left(j\omega L_3 + R_4 + \frac{1}{j\omega C_5}\right)}$$

100Ω; $-j159{,}16\,\Omega$; $500 + j46{,}92\,\Omega$; $500 - j15{,}92\,\Omega$; $500 + j46{,}92\,\Omega$

$48{,}23 - j148{,}33\,\Omega$

$148{,}23 - j148{,}33$

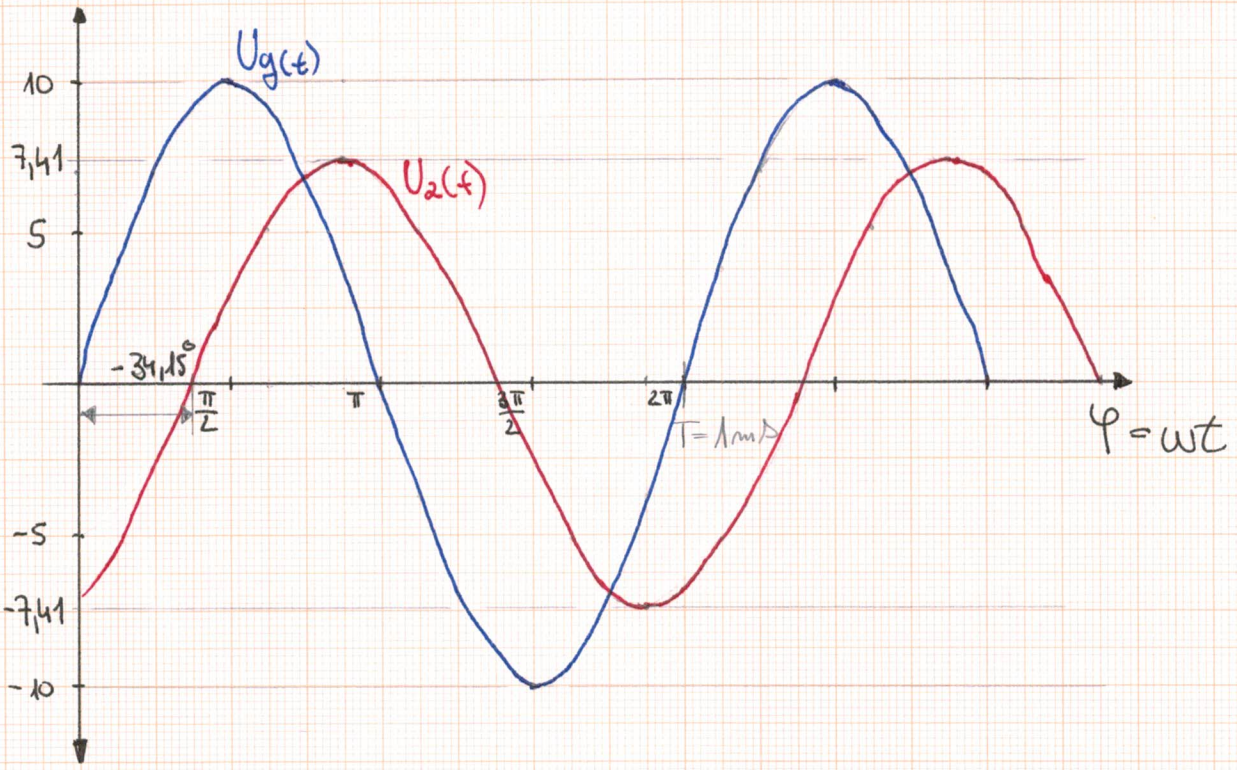
$$\frac{U_2(j\omega)}{U_g(j\omega)} = \frac{(48{,}23 - j148{,}33) \cdot (500 - j15{,}92)}{(148{,}23 - j148{,}33) \cdot (500 + j46{,}92)} = \frac{21753{,}59 - j74932{,}82}{81074{,}64 - j67210{,}04} =$$

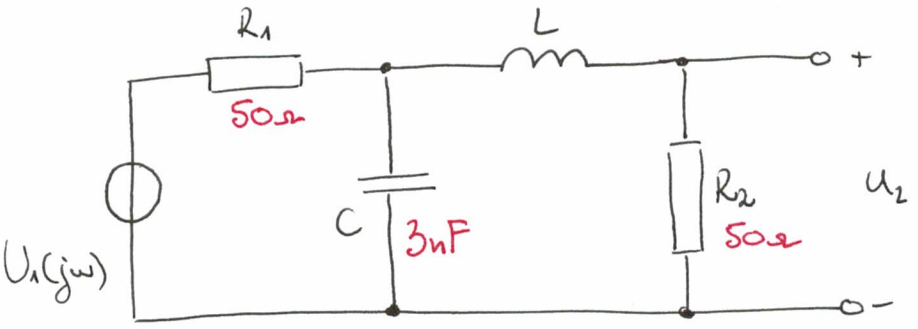
$$= \underline{(0{,}61 - j\,0{,}42)}$$

$$U_2(j\omega) = H(j\omega) \cdot U_g(j\omega)$$

$$= (0{,}61 - j\,0{,}42) \cdot 10V$$

$$= 6{,}1 - j4{,}2 = \underline{7{,}41 \cdot e^{-j34{,}15°}}$$


$U_g(t)$
$U_2(t)$
10
7,141
5
-5
-7,141
-10
$-34,15°$
$\frac{\pi}{2}$
π
$\frac{3\pi}{2}$
2π
$T = 1\,ms$
$\varphi = \omega t$



S tuljavo L kompenziramo tozni premik v vezju.

$$u_1(t) = 10V \cdot \sin(2\pi \cdot 1MHz \cdot t)$$

$$H(j\omega) = \frac{u_2(j\omega)}{u_1(j\omega)}$$

$-j53{,}05$ $\quad 50+j\omega L$ $\quad 50\Omega$

$$u_2(j\omega) = \frac{u_1(j\omega) \cdot \frac{1}{j\omega C} \parallel (j\omega L + R_2) \cdot R_2}{\left(R_1 + \frac{1}{j\omega C} \parallel (j\omega L + R_2)\right) \cdot (j\omega L + R_2)}$$

50Ω $\quad -j53{,}05$ $\quad 50+j\omega L$ $\quad 50+j\omega L$

$$\frac{u_2(j\omega)}{u_1(j\omega)} = \frac{\frac{1}{j\omega C} \cdot (j\omega L + R_2) \cdot R_2}{\left(\frac{1}{j\omega C} + j\omega L + R_2\right)} \Big/ \left(R_1 + \frac{\frac{1}{j\omega C} \cdot (j\omega L + R_2)^2}{\left(\frac{1}{j\omega C} + j\omega L + R_2\right)}\right) = \frac{R_2 \cdot \frac{1}{j\omega C} \cdot (j\omega L + R_2)}{R_1\left(\frac{1}{j\omega C} + j\omega L + R_2\right) + \frac{1}{j\omega C} \cdot (j\omega L + R_2)^2}$$

$$= \frac{R_2 \frac{1}{j\omega C} (j\omega L + R_2)}{(j\omega L + R_2) \cdot \left(R_1 \left(\frac{1}{j\omega C \cdot (j\omega L + R_2)} + 1\right) + \frac{1}{j\omega C} \cdot (j\omega L + R_2)\right)}$$

$$= \frac{R_2 \frac{1}{j\omega C}}{\frac{1}{j\omega C} \cdot \left(\left(\frac{R_1}{j\omega L + R_2} + j\omega C\right) + (j\omega L + R_2)\right)} = \frac{R_2}{\frac{R_1 - \omega^2 LC + j\omega C R_2 + (j\omega L + R_2)^2}{j\omega L + R_2}}$$

$$= \frac{j\omega L R_2 + R_2^2}{\underbrace{R_1 - \omega^2 LC}_{R_e} + \underbrace{j\omega C R_2 - \omega^2 L^2}_{R_e} + 2j\omega L R_2 + \underbrace{R_2^2}_{R_e}} = \frac{j\omega L R_2 + R_2}{(R_1 - \omega^2 LC - \omega^2 L^2 + R_2^2) + j(\omega C R_2 + 2\omega L R_2)}$$

$$= \frac{(j\omega L R_2 + R_2) \cdot (-j(\omega C R_2 + 2\omega L R_2))}{(R_1 - \omega^2 LC - \omega^2 L^2 + R_2^2)^2 + (\omega C R_2 + 2\omega L R_2)^2}$$

$$\mathrm{Im}\{H(j\omega)\} = \emptyset$$

$$\frac{\overbrace{-0{,}943}^{} \overbrace{-200\omega L}^{}}{-\omega C R_2 - 2\omega L R_2} = \emptyset \quad / \cdot (\text{imenovalec})$$
$$(R_1 - \omega^2 LC - \omega^2 L^2 + R_2^2)^2 + (\omega C R_2 + 2\omega L R_2)^2$$

$$-0{,}943 - 200\omega L = \emptyset$$

$$L = \frac{0{,}943}{-200\omega} = \frac{0{,}943}{-1256{,}64 \cdot 1 \cdot 10^6} = -750 \cdot 10^{-12}$$

$$= -75\ \mathrm{pH}$$