3a i) $v_d(t) = 0 \qquad i_+(t) = 0$

ii) $v_x(t) = i_{in}(t)\, R_3 \qquad v_{R1}(t) = v_x(t)$

ϕ_1 geschl. $\rightarrow v_{out}(t) = v_{R1}(t)$

ϕ_2 offen $\rightarrow i_{R2}(t) = i_{R1}(t) = \dfrac{v_{R1}(t)}{R_1} = i_{in}(t)\,\dfrac{R_3}{R_1}$

$$v_{out}(t) = v_{R2}(t) + v_{R1}(t) = i_{in}(t)\left(\frac{R_2 R_3}{R_1} + R_3\right)$$

iii) (Nicht-invertierender) Verstärker mit zwei verschiedenen Verstärkungsfaktoren

3b i) $\underline{Z}_{tot} = R_1 + R_2 + j\omega 2L$

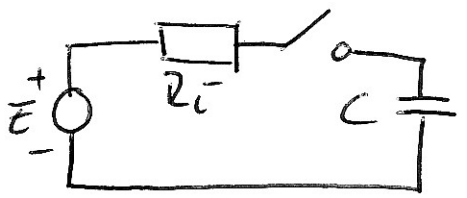
ii) $\underline{V}_{L_2} = \underline{V}_s \dfrac{\underline{Z}_{L_1 \| L_2}}{\underline{Z}_{tot}} = \dfrac{A}{\sqrt{2}} e^{j\phi_0} \dfrac{j\omega 2L}{R_1 + R_2 + j\omega 2L}$

iii) $\underline{I}_{L_1} = \dfrac{\underline{V}_{L_1}}{\underline{Z}_{L_1}}$

$$\angle(\underline{I}_{L_1}) = \phi_0 - \operatorname{atan}\left(\frac{\omega 2L}{R_1 + R_2}\right)$$

$$|\underline{I}_{L_1}| = \frac{A}{3\sqrt{2}} \frac{1}{\sqrt{(R_1 + R_2)^2 + (\omega 2L)^2}}$$

3c i)



$R_i = 900\,\Omega$

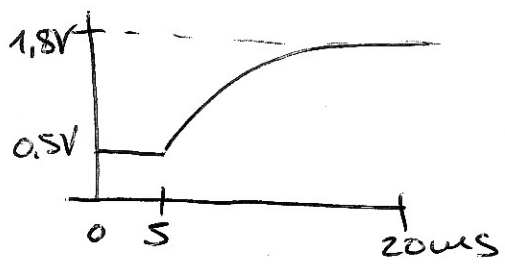
$E = I R_i = 1{,}8\,V$

ii) $v_c(t_{0+}) = \dfrac{Q_0}{C} = 500\,mV$

$$i_c(t_{0+}) = \frac{E - v_c(t_{0+})}{R_i + R_{sw,on}} = 1{,}432\,mA$$

iii) $V_c(t_0 - \infty) = E = 1{,}8\,V$

iv)



$t_0 = 5\,ms$

$V_c(t_0) = 0{,}5\,V$

$V_c(t_0 - \infty) = 1{,}8\,V$

v) $\tau = (R_1 + R_{sw,on})\,C = 2{,}724\,ms$

$V_c(t) = E - (E - V_c(t_0))\,e^{-\frac{t - t_0}{\tau}}$

$V_{c\,95\%} = 0{,}95\,E \doteq V_c(t_{95})$

$\longrightarrow \quad t_{95} = 12{,}27\,ms$