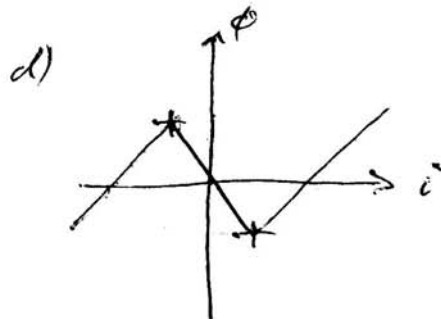
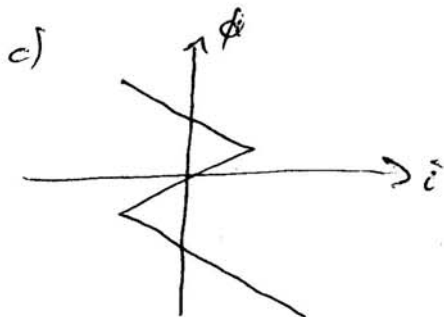
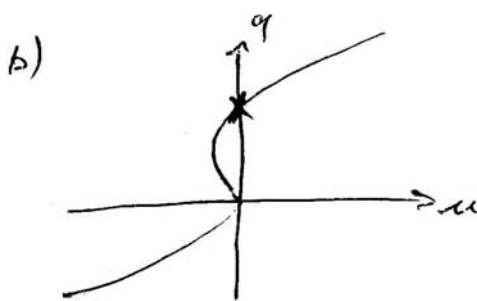
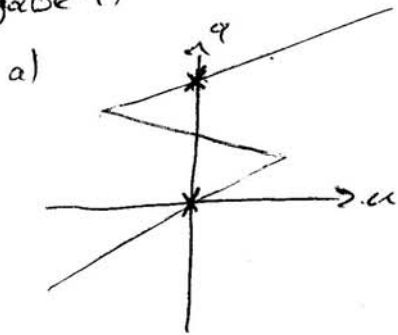
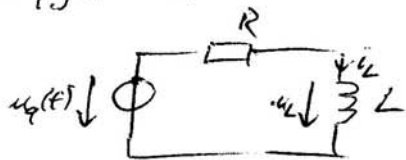


# Aufgabe 1)



keine RP

# Aufgabe 2)



1. Zustandsgröße =  $i_L$

2. DGL aufstellen

$$u_L = L \dot{i}_L \quad u_L = -R i_L + u_q(t)$$

$$\Rightarrow L \dot{i}_L = -R i_L + u_q(t)$$

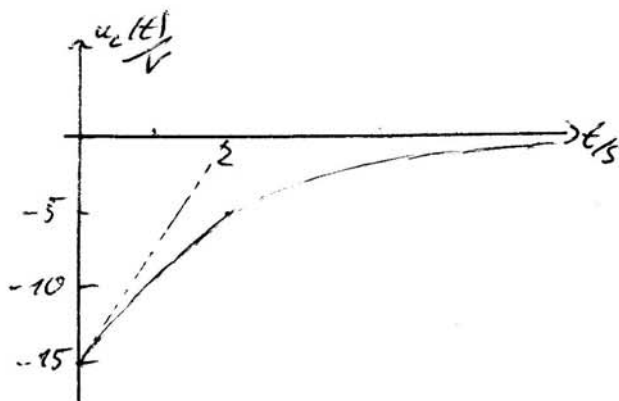
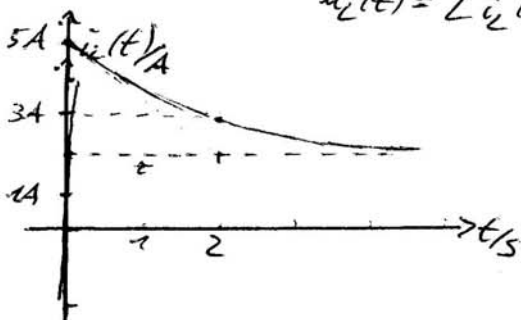
3. Umformen:  $\dot{i}_L = -\frac{R}{L} i_L + \frac{R u_q(t)}{L R} = -\frac{i_L}{\tau} + \frac{u_q(t)/R}{L/R}$

4.  $\tau = \frac{L}{R} \quad \left[ \frac{Vs}{s} \right] = [s] \quad \varphi = \frac{u_q(t)}{R} \quad [A]$

$t_0 = 0 \quad i_L(t_0) = I_{L0}$

5. a)  $\varphi = \frac{24}{R} \Rightarrow i_L(t) = \frac{24}{R} + \left[ I_{L0} - \frac{24}{R} \right] e^{-\frac{t}{\tau}}$

$$u_L(t) = L \dot{i}_L(t) = L \cdot \left( -\frac{1}{\tau} \right) \left[ I_{L0} - \frac{24}{R} \right] e^{-\frac{t}{\tau}} = \left[ u_1 - R I_{L0} \right] e^{-\frac{t}{\tau}}$$



$$b) \varphi = \frac{u_1(t)}{R} = \frac{u_1 \sin \omega t}{R}$$

$$\Rightarrow i_L(t) = I_{L0} e^{-\frac{t}{\tau}} + \frac{1}{L} \int_0^t \frac{u_1}{R} \sin \omega t' e^{-\frac{t-t'}{\tau}} dt' =$$

$$= I_{L0} e^{-\frac{t}{\tau}} + \frac{u_1}{L} e^{-\frac{R}{L}t} \int_0^t e^{\frac{R}{L}t'} \sin \omega t' dt' =$$

$$= I_{L0} e^{-\frac{R}{L}t} + \frac{u_1}{L} e^{-\frac{R}{L}t} \left[ \frac{e^{\frac{R}{L}t'}}{\frac{R^2}{L^2} + \omega^2} \left( \frac{R}{L} \sin \omega t' - \omega \cos \omega t' \right) \right]_0^t =$$

$$= I_{L0} e^{-\frac{R}{L}t} + \frac{u_1}{L} e^{-\frac{R}{L}t} \left( \frac{e^{\frac{R}{L}t}}{\frac{R^2}{L^2} + \omega^2} \left( \frac{R}{L} \sin \omega t - \omega \cos \omega t \right) + \frac{\omega}{\frac{R^2}{L^2} + \omega^2} \right) =$$

$$= \left( I_{L0} + \frac{u_1 L \omega}{R^2 + L^2 \omega^2} \right) e^{-\frac{R}{L}t} + \frac{u_1}{R^2 + \omega^2 L^2} (R \sin \omega t - L \omega \cos \omega t)$$

$$u_L(t) = L \dot{i}_L = \dots$$