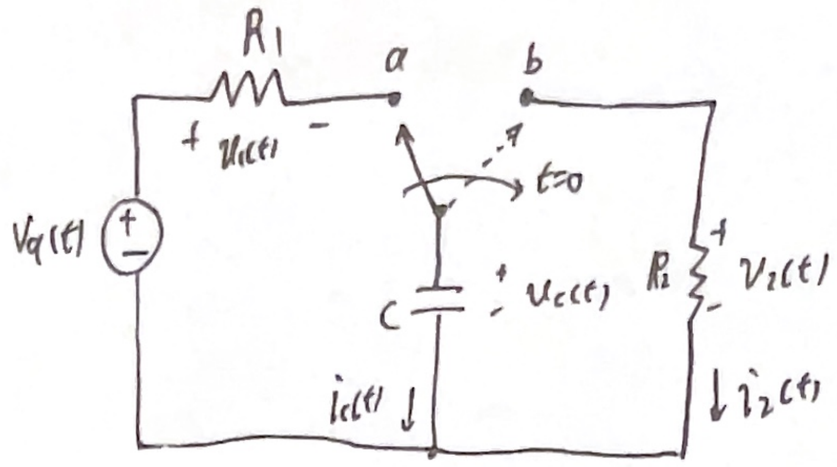
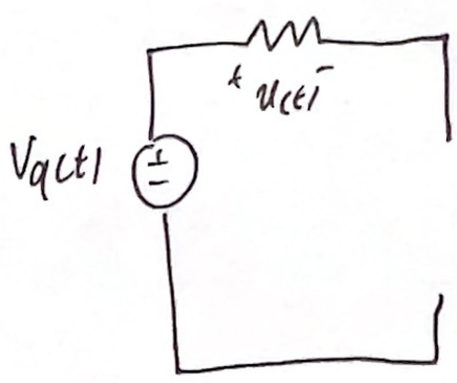
Aufgabe 3



$t<0$ eingeschwungen

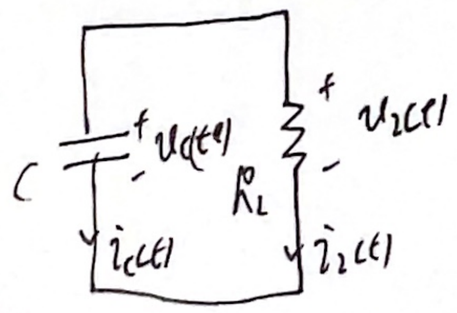
$u_c(0^-) = u_c(0) = u_c(0^+)$

a f. $u_c(t)$ $t<0$



eingeschwungen $\Rightarrow$ $u_c(0^-) = V_q(t)$

b. $u_c(t)$, $t>0$



KCL: $i_c(t) + i_2(t) = 0 \iff i_c(t) = -i_2(t)$

$C\frac{du_c(t)}{dt} + i_2(t) = 0$

KVL: $u_c(t) = u_2(t) \iff u_c(t) = u_2(t)$

$u_2(t) = R_2 \cdot i_2(t)$

$\Rightarrow C\frac{du_c(t)}{dt} + \frac{u_2(t)}{R_2} = C\frac{du_c(t)}{dt} + \frac{u_c(t)}{R_2} = 0$

$\iff C\frac{du_c(t)}{dt} = -\frac{u_c(t)}{R_2}$

$du_c(t) = \frac{1}{R_2 C} u_c(t)\, dt$ $\iff u_c(t) = V_q(t)\, e^{-\frac{t}{R_2 C}}$

$\int_{u_c(0)}^{u_c(t)} \frac{1}{u_c(t')} du_c(t') = -\frac{1}{R_2 C}\int_0^t dt'$

$\ln \frac{u_c(t)}{u_c(0)} = -\frac{1}{R_2 C} t$

$\frac{u_c(t)}{u_c(0)} = e^{-\frac{t}{R_2 C}}$