ERT 20

Ομάδα 3) $\frac{d}{dt} i(0) = 0 \Rightarrow v_C = 0$

Ομάδα 4) $t \to \infty \Rightarrow v_C = 5\,V$

Ομάδα 5) $U = v_R + v_C$

$U = v_C + R\, i(t)$

$U = v_C + RC \frac{d}{dt} v_C(t)$

$\frac{d}{dt} v_C(t) + \frac{1}{RC} v_C(t) = \frac{U}{RC}$

$\frac{d}{dt} v_C(t) + v_C(t) = U \quad | \cdot e^t$

$\frac{d}{dt}(v_C e^t) = U e^t \quad | \cdot \int dt$

$v_C e^t = U e^t + D \quad | \cdot e^{-t}$

$v_C(t) = U + D e^{-t}$

$v_C(t) = U + D e^{-t}$

$v_C(0) = 0$

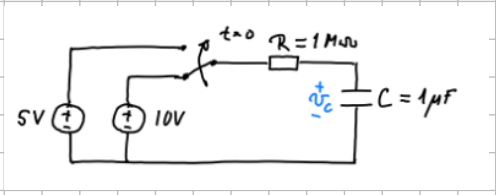
$U + D = 0$

$D = -U$

$v_C(t) = U - U e^{-t} \qquad U = 5\,V$

$v_C(t) = 5(1 - e^{-t})$

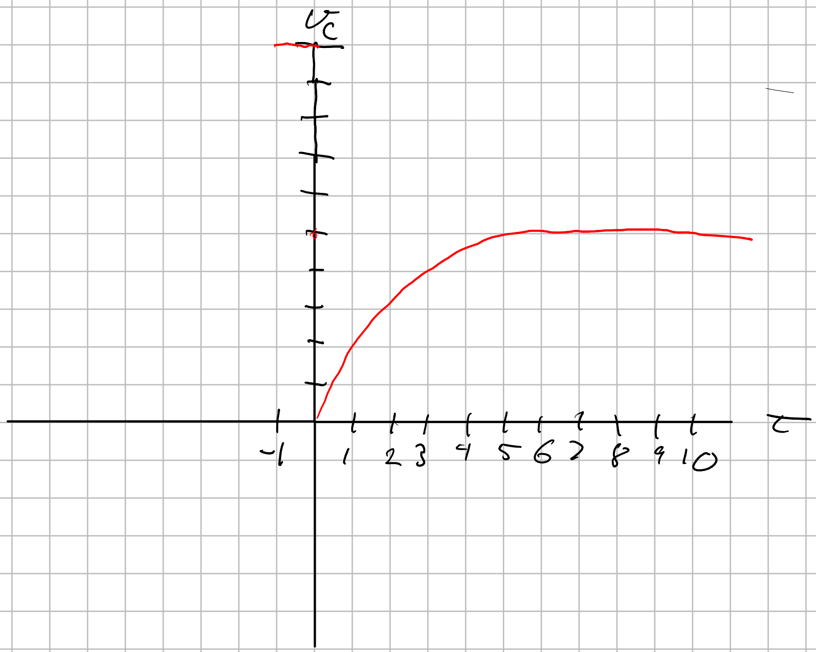
$i(t) = C \frac{d}{dt} v_C(t)$



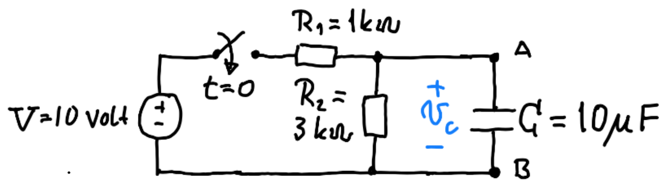
$R = 1\,M\Omega \quad C = \mu F$

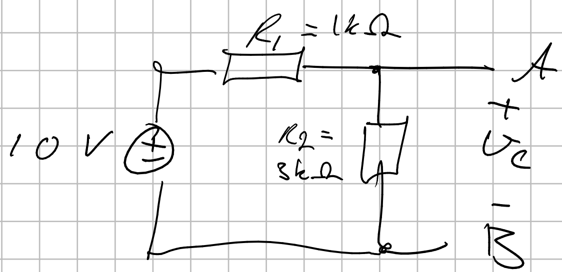
$RC = 1\,0^6 \cdot 1\,0^{-6} = 1\,0^0 = 1$

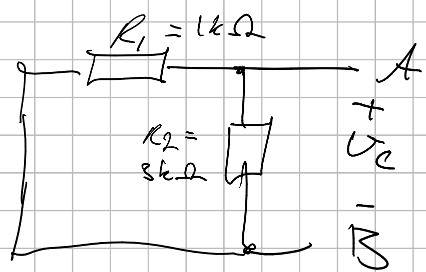
Oppg 6)



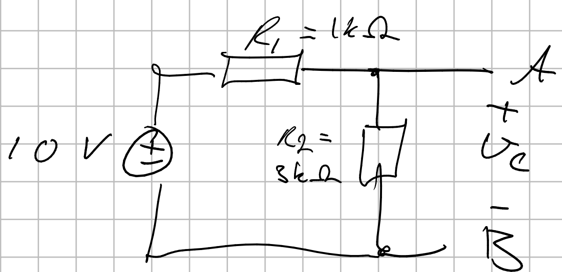
Oppg 7) $v_C = 5\ V$





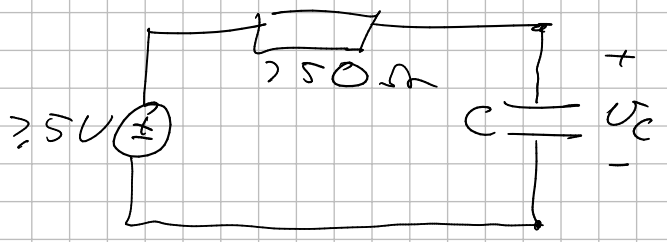


$$R_{th} = \frac{R_1 R_2}{R_1 + R_2} = \frac{1 \cdot 3}{4} = 750\ \Omega$$



$$U_{th} = U \frac{R_2}{R_1 + R_2}$$

$$U_{th} = 10 \cdot \frac{3}{4} = 7{,}5\ V$$



Aufg 8) $i(t) = C \frac{d}{dt} u_c \quad R = 50\,\Omega \quad C = 10\,\mu F$

$$U = i(t) R + u_c$$

$$U = RC \frac{d}{dt} u_c + u_c$$

$$U = \frac{d}{dt} u_c + \frac{1}{RC} u_c$$

$$u_c(t) = RCU + D e^{-\frac{1}{RC} t}$$

$$u_c(0) = 0$$

$$RCU + D = 0$$

$$D = -RCU$$

$$u_c(t) = RCU\left(1 - e^{-\frac{1}{RC} t}\right)$$

$$\dot{x} + b\,x = k$$

$$\frac{d}{dt}\left(x e^{\lambda t}\right) = k e^{\lambda t}$$

$$x e^{\lambda t} = \frac{1}{\lambda} k e^{\lambda t} + C \quad | \int \cdot e^{-\lambda t}$$

$$x(t) = \frac{k}{\lambda} + C e^{-\lambda t}$$

$$U = i(t) R + u_c$$

$$U = RC \frac{d}{dt} u_c + u_c$$

$$U = \frac{d}{dt} u_c + \frac{1}{RC} u_c \quad | \cdot e^{\frac{1}{RC} t}$$

$$\frac{d}{dt} u_c e^{\frac{1}{RC} t} + \frac{1}{RC} u_c e^{\frac{1}{RC} t} = U e^{\frac{1}{RC} t}$$

$$\frac{d}{dt}\left(u_c e^{\frac{1}{RC} t}\right) = U e^{\frac{1}{RC} t} \quad | \int dt$$

$$u_c e^{\frac{1}{RC} t} = RCU e^{\frac{1}{RC} t} + D \quad | \cdot e^{-\frac{1}{RC} t}$$

$$u_c(t) = RCU + D e^{-\frac{1}{RC} t}$$

$$u_c(0) = 0$$

$$D = -RCU$$