Aufladen eines Kondensators - Theorie - Lösung

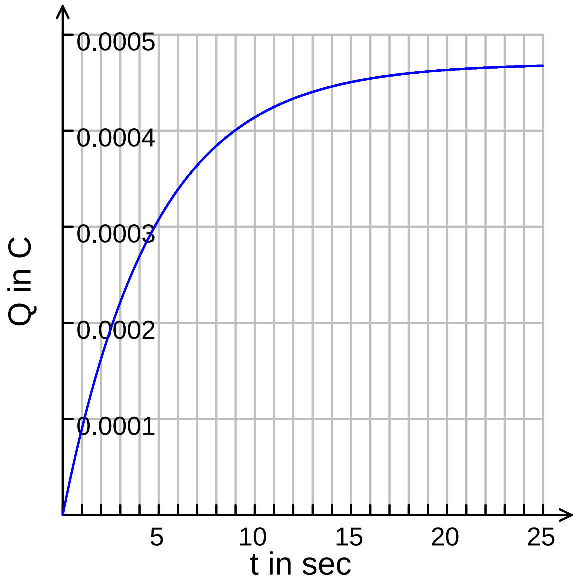
1.a)

$Q(t) := Q0 \cdot \left(1 - \exp\left(\frac{-1}{R \cdot C} \cdot t\right)\right)$ "Done" $Q0 := -C \cdot U0$ $-c \cdot u0$

$\frac{d}{dt}(Q(t)) + \frac{1}{R \cdot C} \cdot Q(t) = \frac{-U0}{R}$ *true*

b)

$R := 1E5$ 100000. $C := 4.7E-5$ .000047 $U0 := -10$ -10



delvar(R)   "Done"   delvar(C)   "Done"   delvar($U0$)   "Done"

c)

$Q(0)$ 0

d)

$\lim_{t \to \infty} (Q(t)) = Q0$

e)

$\text{round}\left(\frac{Q(R \cdot C)}{Q0}, 2\right)$ .63

f)

$\text{solve}\left(Q(t) = \frac{1}{2} \cdot Q0, t\right)$ $t = c \cdot \ln(2) \cdot r$

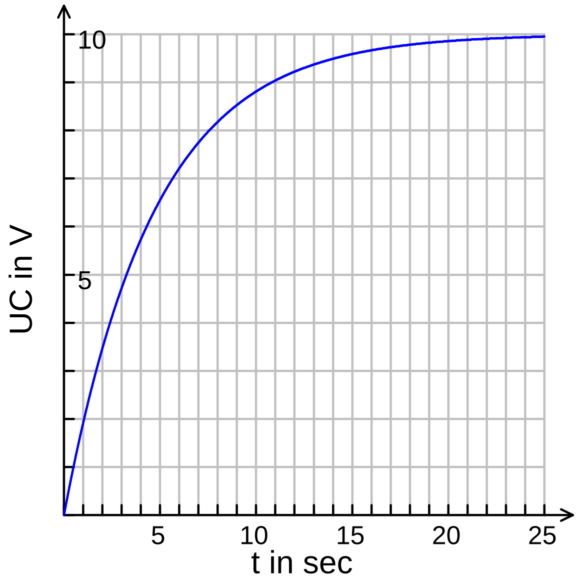
Aufladen eines Kondensators - Theorie - Lösung

2.a)

$\mathrm{UC}(t) := \dfrac{Q(t)}{C}$ "Done" $\mathrm{UC}(t)$ $-u0 \cdot \left(e^{t/(c \cdot r)} - 1\right) \cdot e^{-t/(c \cdot r)}$

b)

$R := 1E5$ 100000. $C := 4.7E-5$ .000047 $U0 := -10$ -10



delvar(R) "Done" delvar(C) "Done" delvar$(U0)$ "Done"

c)

$\mathrm{UC}(0)$ 0

d)

$\lim_{t \to \infty} \left(\mathrm{UC}(t)\right) = -U0$

e)

$\mathrm{round}\left(\dfrac{\mathrm{UC}(R \cdot C)}{-U0}, 2\right)$ .63

f)

$\mathrm{solve}\left(\mathrm{UC}(t) = \dfrac{1}{2} \cdot (-U0), t\right)$ $t = c \cdot \ln(2) \cdot r$

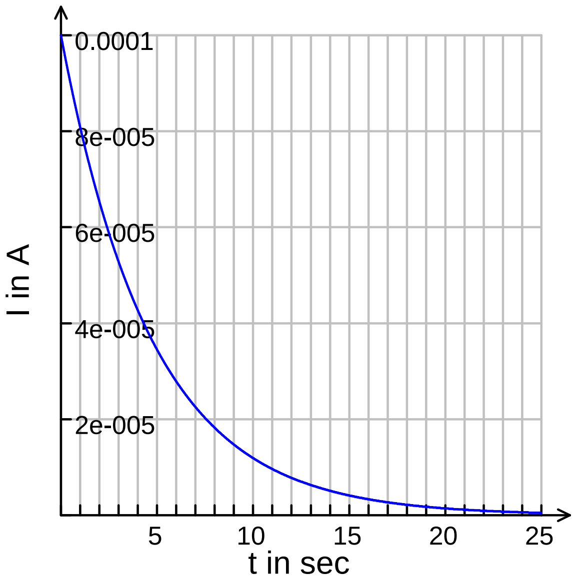
Aufladen eines Kondensators - Theorie - Lösung

3.a)

$I(t) := \frac{d}{dt}(Q(t))$ "Done" $I(t)$ $\frac{-u0 \cdot e^{-t/(c \cdot r)}}{r}$

b)

$R := 1E5$ 100000. $C := 4.7E-5$ .000047 $U0 := -10$ -10



delvar(R) "Done" delvar(C) "Done" delvar(U0) "Done"

c)

$I(0)$ $\frac{-u0}{r}$

d)

$\lim_{t \to \infty} (I(t)) = 0$

e)

$\text{round}\left(\frac{I(R \cdot C)}{\frac{-U0}{R}}, 2\right)$ .37

f)

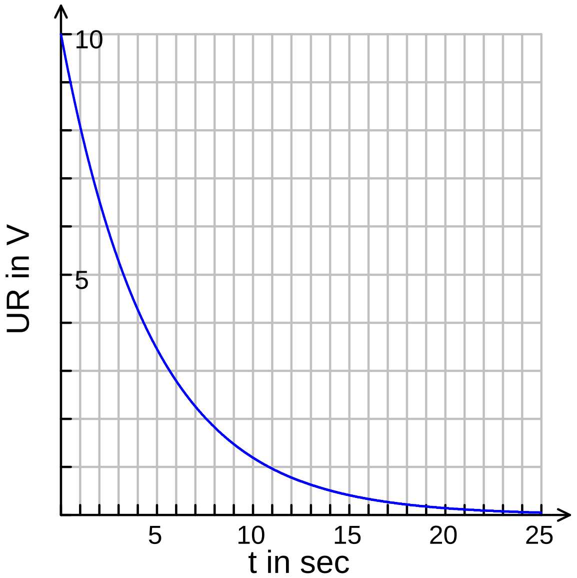
$\text{solve}\left(I(t) = \frac{1}{2} \cdot \left(\frac{-U0}{R}\right), t\right)$ $t = c \cdot \ln(2) \cdot r$

4.a)

$\mathrm{UR}(t) := R \cdot I(t)$ "Done" $\mathrm{UR}(t)$ $-u0 \cdot e^{-t/(c \cdot r)}$

b)

$R := 1E5$ 100000. $C := 4.7E-5$ .000047 $U0 := -10$ -10



$\mathrm{delvar}(R)$ "Done" $\mathrm{delvar}(C)$ "Done" $\mathrm{delvar}(U0)$ "Done"

c)

$\mathrm{UR}(0)$ $-u0$

d)

$\lim_{t \to \infty} (\mathrm{UR}(t)) = 0$

e)

$\mathrm{round}\left(\frac{\mathrm{UR}(R \cdot C)}{-U0}, 2\right)$ .37

f)

$\mathrm{solve}\left(\mathrm{UR}(t) = \frac{1}{2} \cdot (-U0), t\right)$ $t = c \cdot \ln(2) \cdot r$

