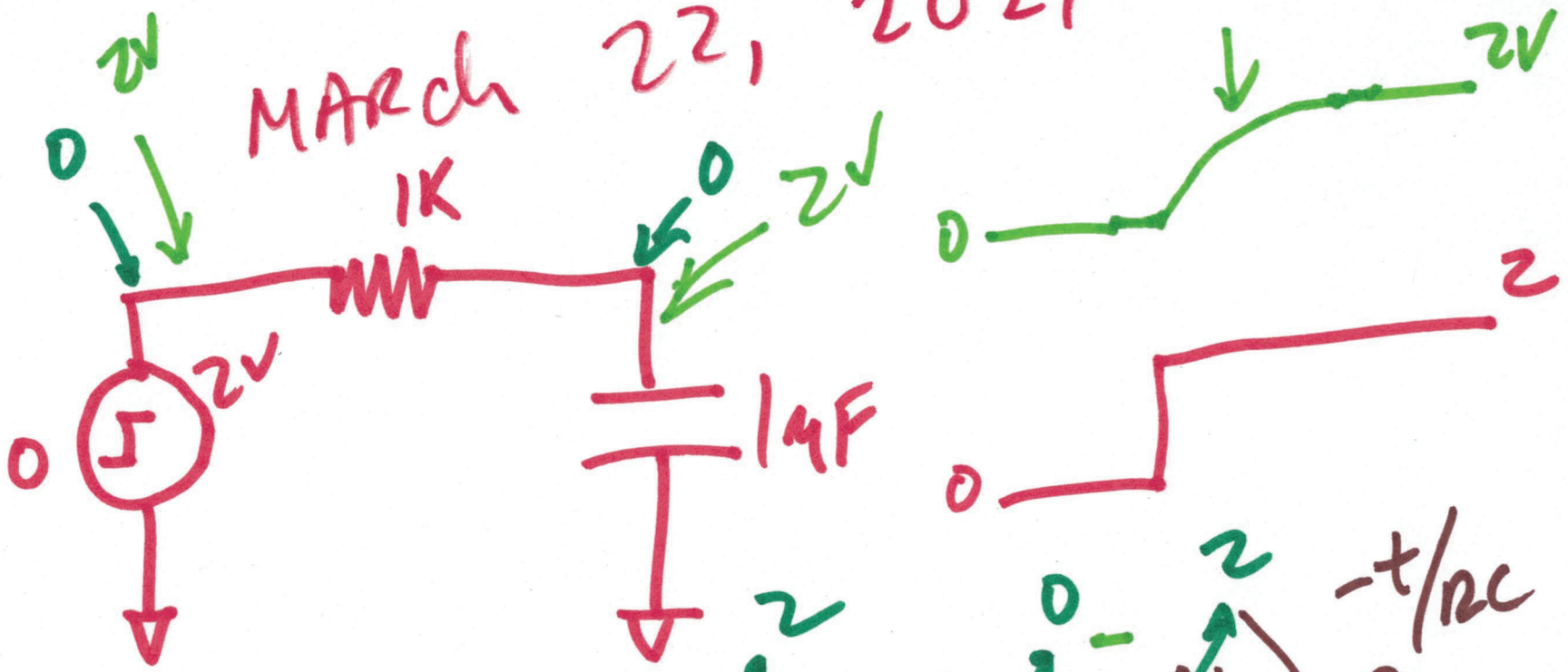
EE 221 Circuits II

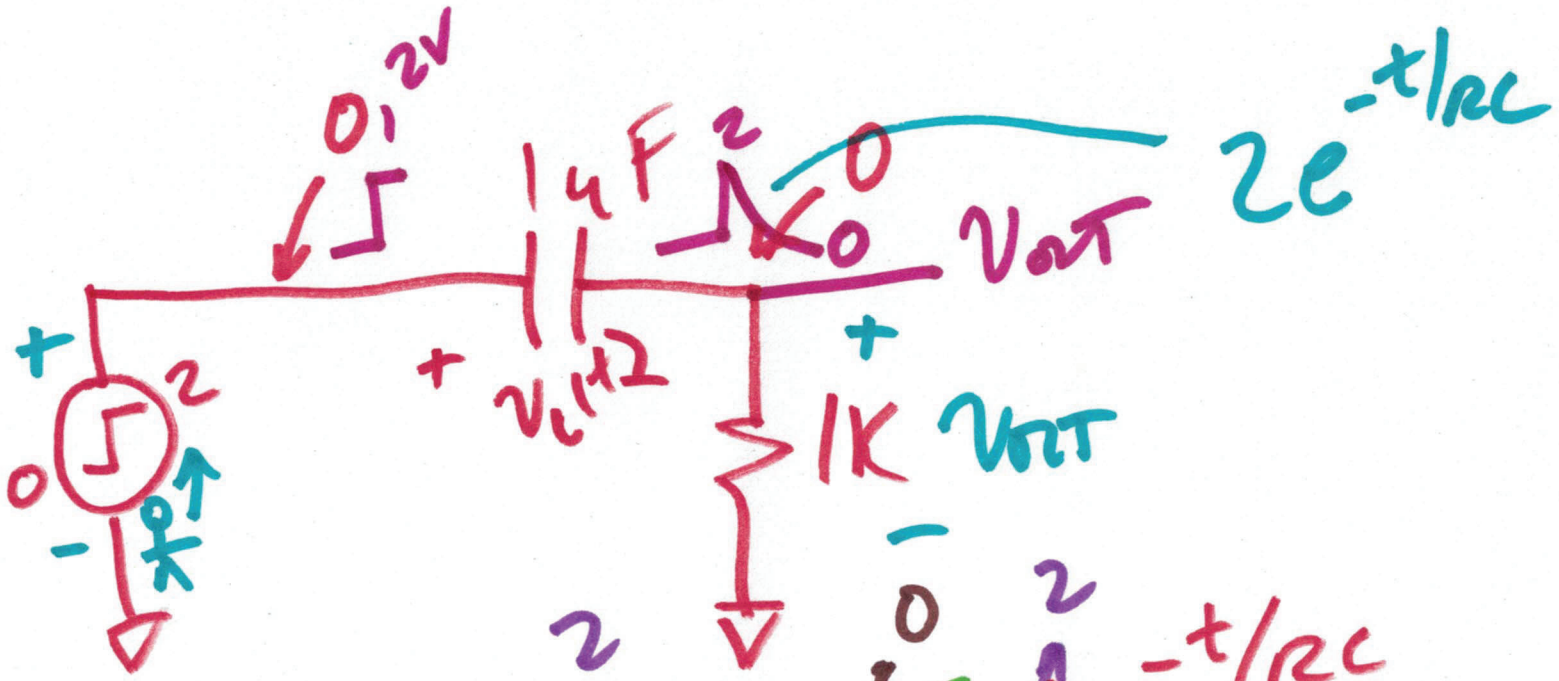
Lecture 14

March 22, 2021



$$v_c(t) = v_f + (v_i + v_f)\, e^{-t/RC}$$

$$2 - 2e^{-t/RC}$$



$$v_c(t) = v_f + (v_i + v_f)e^{-t/RC}$$

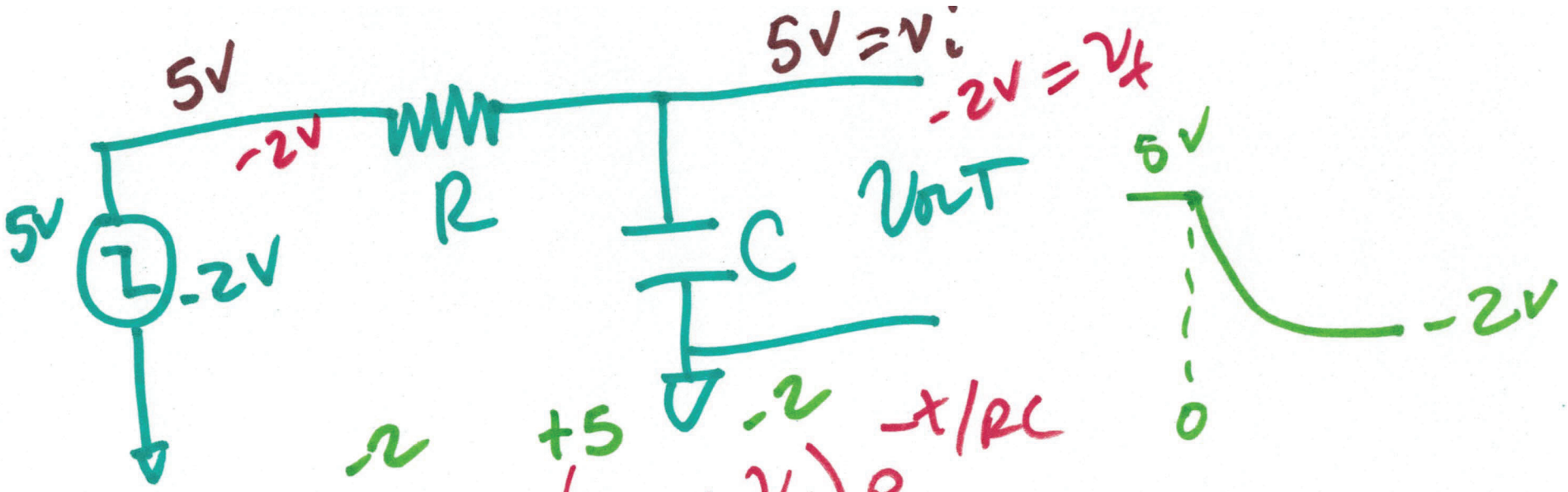
$$v_c(t) = 2(1 - e^{-t/RC})$$

$$2 - v_c(t) - v_{out} = 0$$

$$v_{out} = 2 - 2 + 2e^{-t/RC}$$

$$= 2e^{-t/RC}$$

2)



$$v_{OUT} = v_f - (v_i + v_f)e^{-t/RC}$$

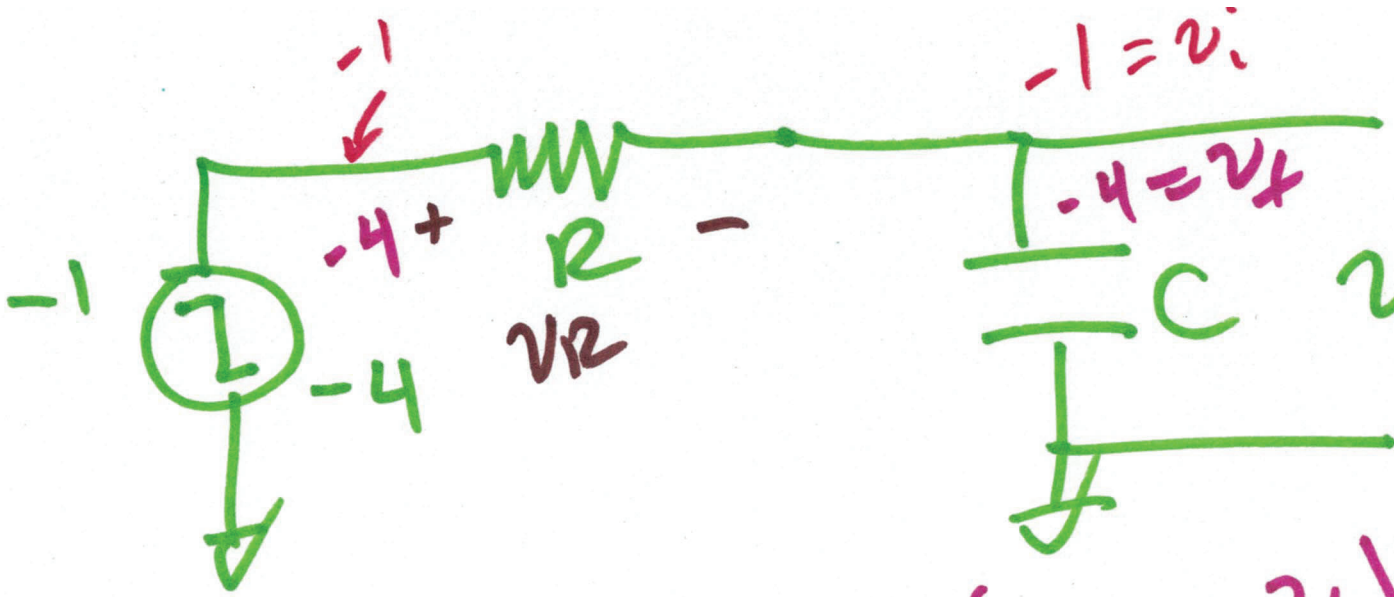
$$-2 \quad +5 \quad -2$$

$$v_{OUT} = +3 + 2e^{-t/RC}$$

$$v_{OUT} = -2 - 3e^{-t/RC}$$

$$v_{OUT} = v_f + (v_i - v_f)e^{-t/RC}$$

$$-2 + (5+2)e^{-t/RC}$$



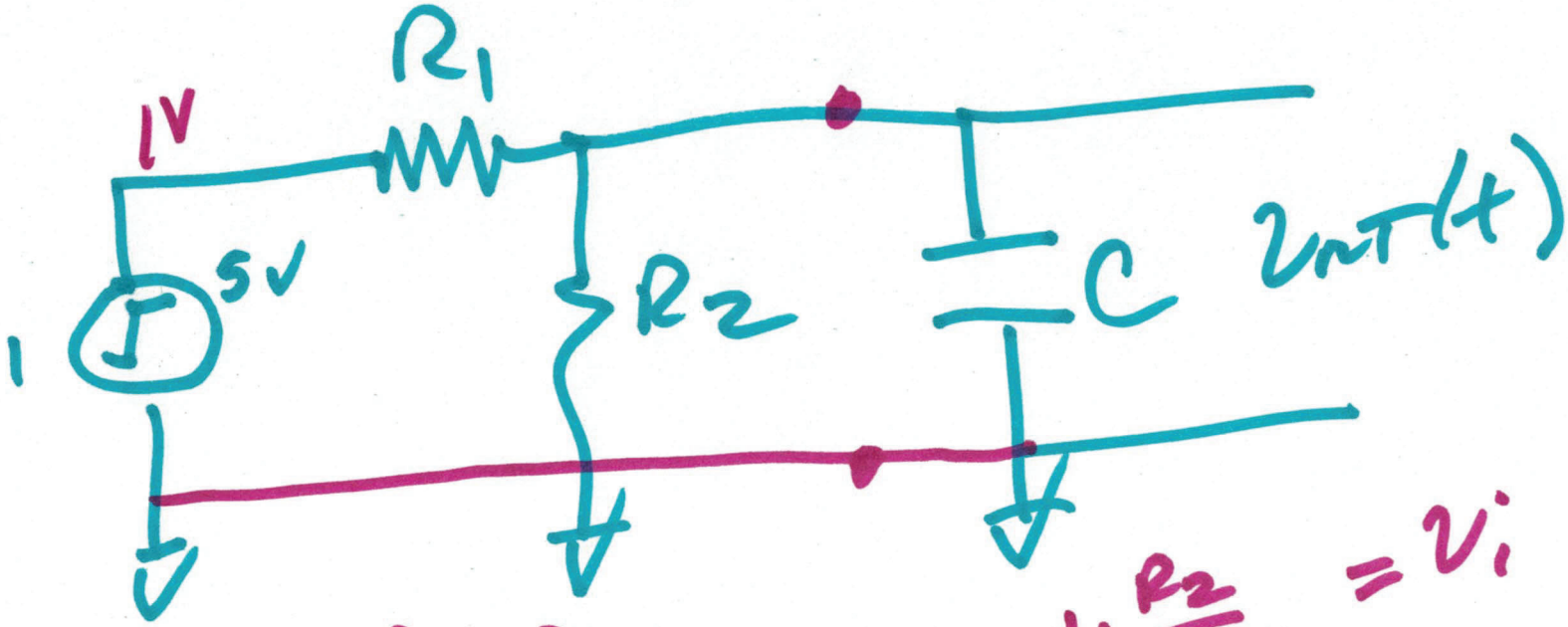
$$v_{OUT} = v_f + (v_i - v_f)\, e^{-t/RC}$$

$$= -4 + (-1 + 4)\, e^{-t/RC}$$

$$\boxed{v_{OUT} = -4 + 3e^{-t/RC}}$$

$$v_R = -4 - v_{OUT}$$

$$= -3e^{-t/RC}$$



$R_1 \| R_2$

$1 \cdot \frac{R_2}{R_1+R_2} = V_i$

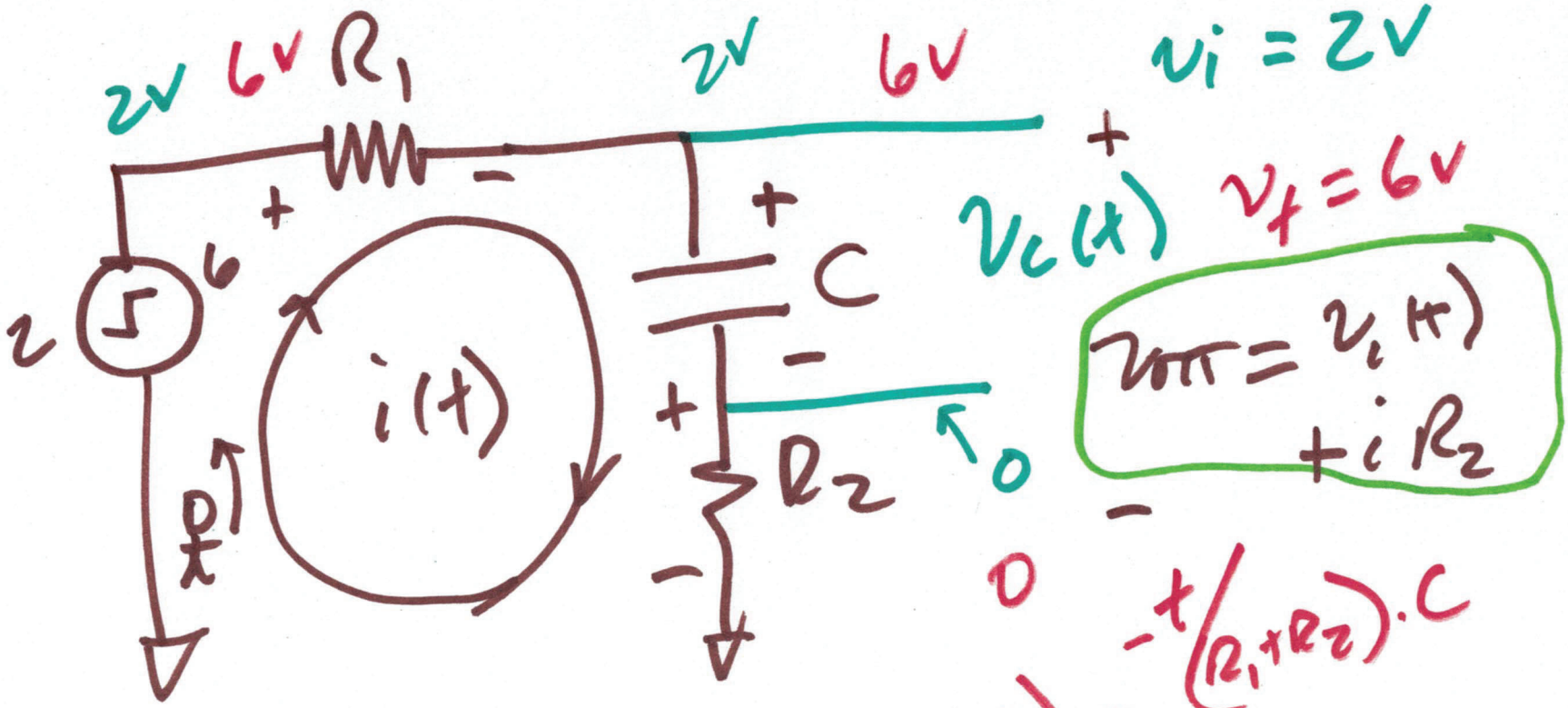
$5 \cdot \frac{R_2}{R_1+R_2} = V_f$

$5 \cdot \frac{R_2}{R_1+R_2}$

$1 \cdot \frac{R_2}{R_1+R_2}$

C_{OUT}

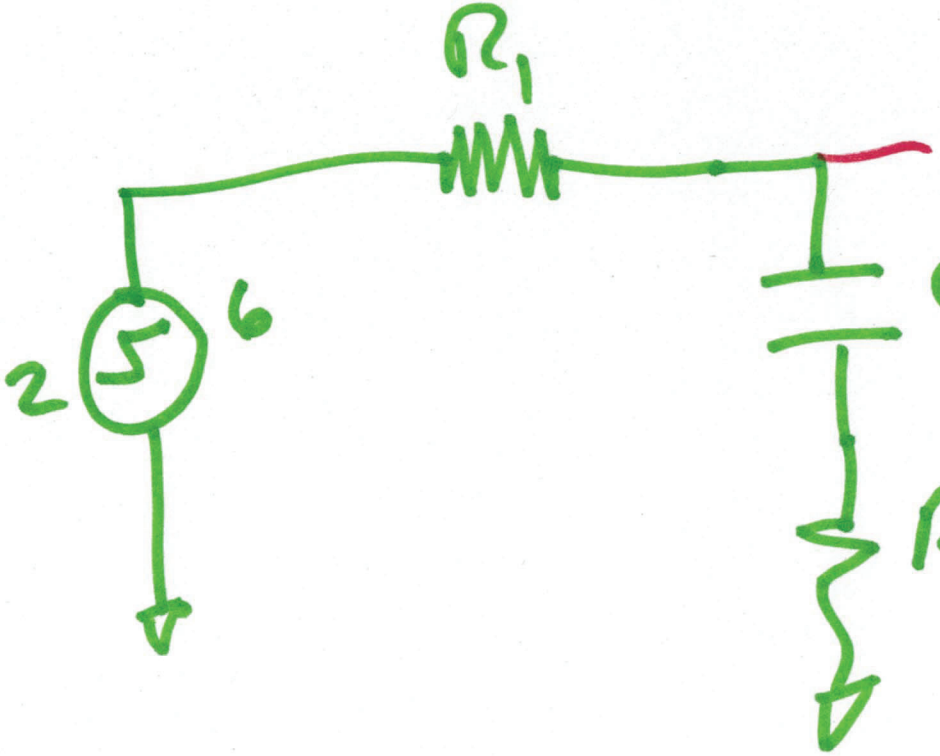
$v_{OUT} = V_f + (V_i - V_f)\, e^{-\frac{t}{R_1 \| R_2 \cdot C}}$



$$v_c(t) = 6 + (2-6)e$$

$$6 - iR_1 - v_c(t) - iR_2 = 0$$

$$i = \frac{6 - v_c(t)}{R_1 + R_2}$$

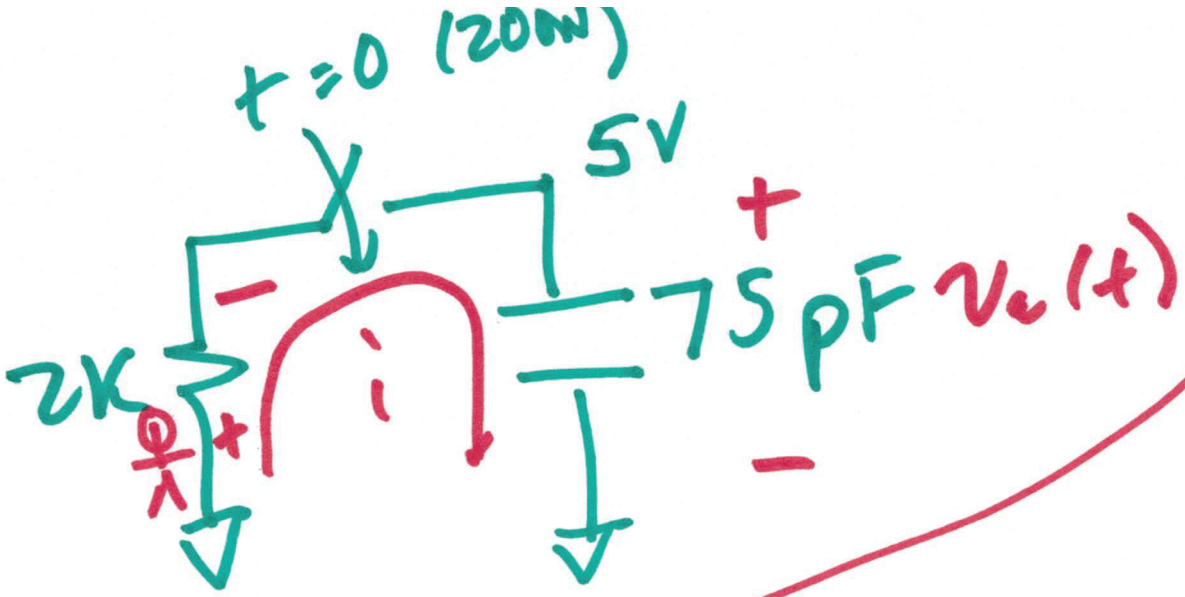


$$\text{with } v_c(t) = 6 - 4e^{-t/(R_1+R_2)C}$$

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

$$i = C\left(0 - \frac{-4e^{-t/(R_1+R_2)C}}{(R_1+R_2)C}\right)$$

$$i = \frac{+4e^{-t/(R_1+R_2)C}}{R_1+R_2}$$



$$i = C\frac{dv_c}{dt}$$

$$-2k \cdot i - v_c(t) = 0$$

$$-2k \cdot 75pF \cdot \frac{dv_c}{dt} - v_c = 0$$

$$v_c = -RC \cdot \frac{dv_c}{dt}$$

$$\frac{dt}{-RC} = \frac{dv_c}{v_c}$$

8)

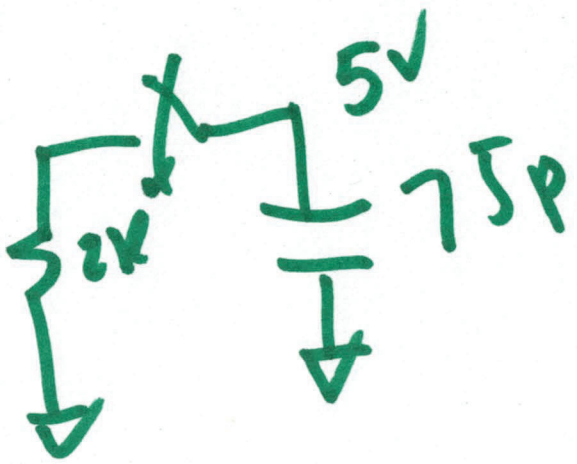
$$\int_0^t \frac{dt}{-RC} = \int_{v_i}^{v_f} \frac{dv_c}{v_c}$$

$$-\frac{t}{RC} = \ln v_c \Big|_{v_i}^{v_f}$$

$$= \ln v_f - \ln v_i$$

$$-\frac{t}{RC} = \ln \frac{v_f}{v_i}$$

$$v_i \cdot e^{-t/RC} = v_f$$



$p = 10^{-12}$

$x = 10^{+3}$

$n = 10^{-9}$

$$v_c = 5e^{-t/150n}$$