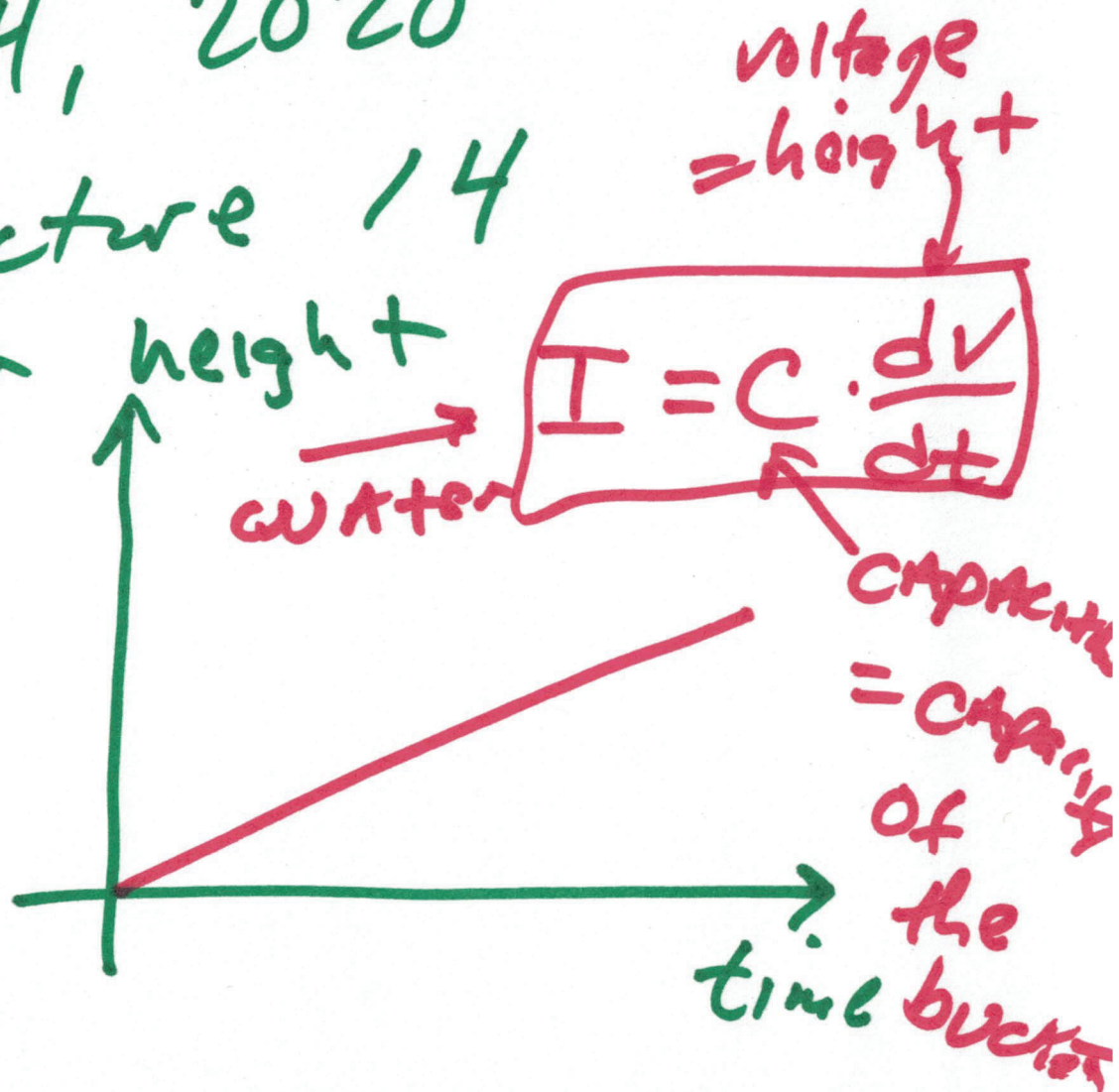
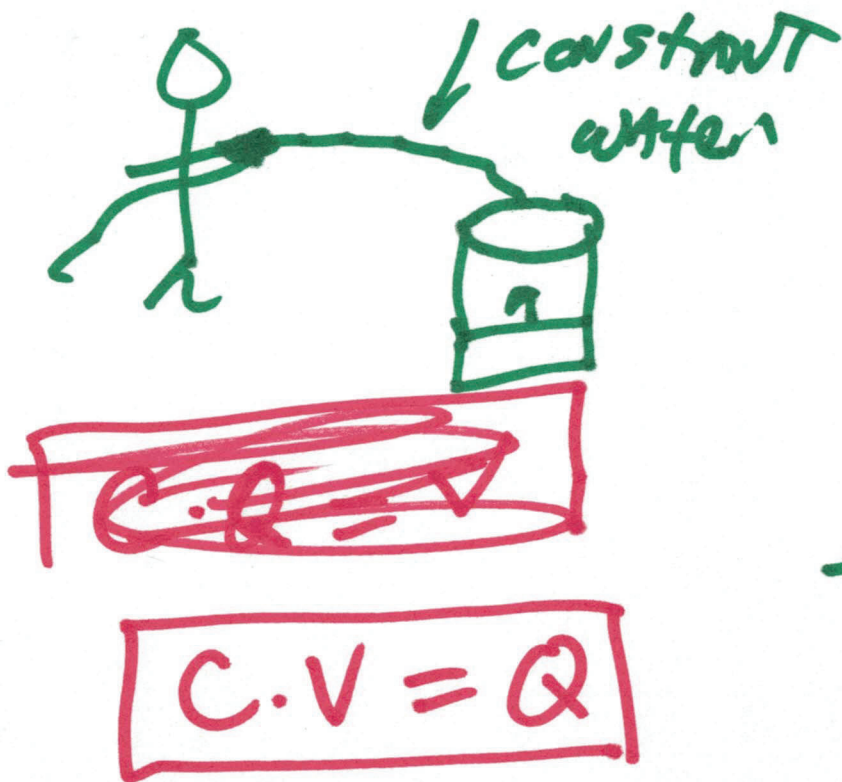
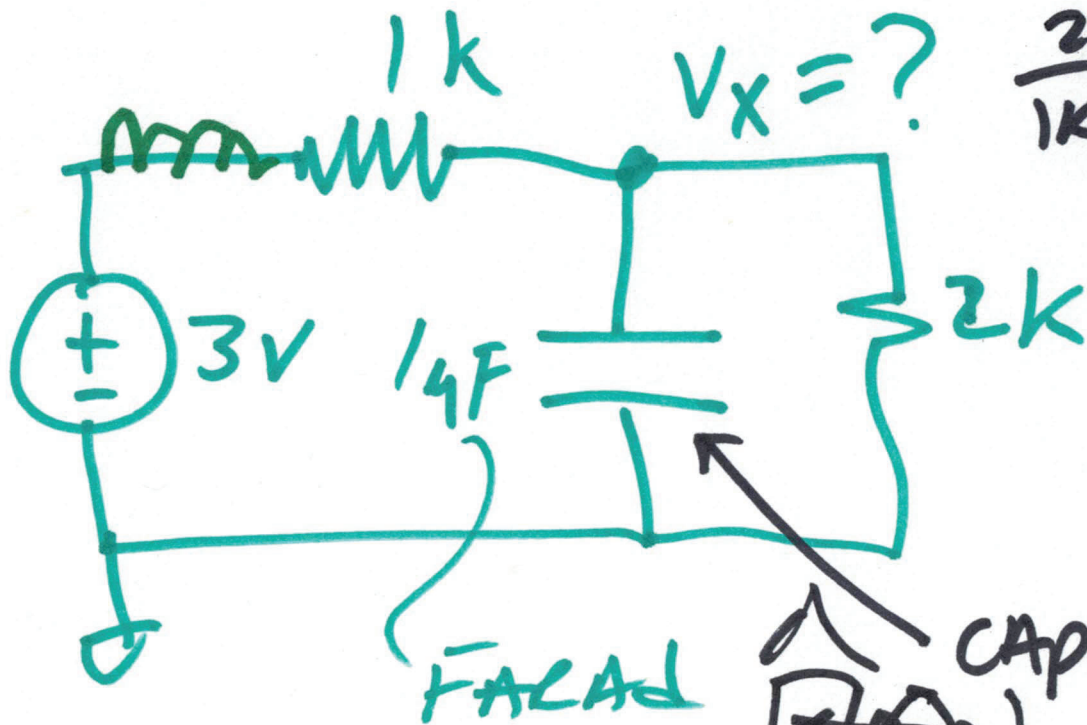


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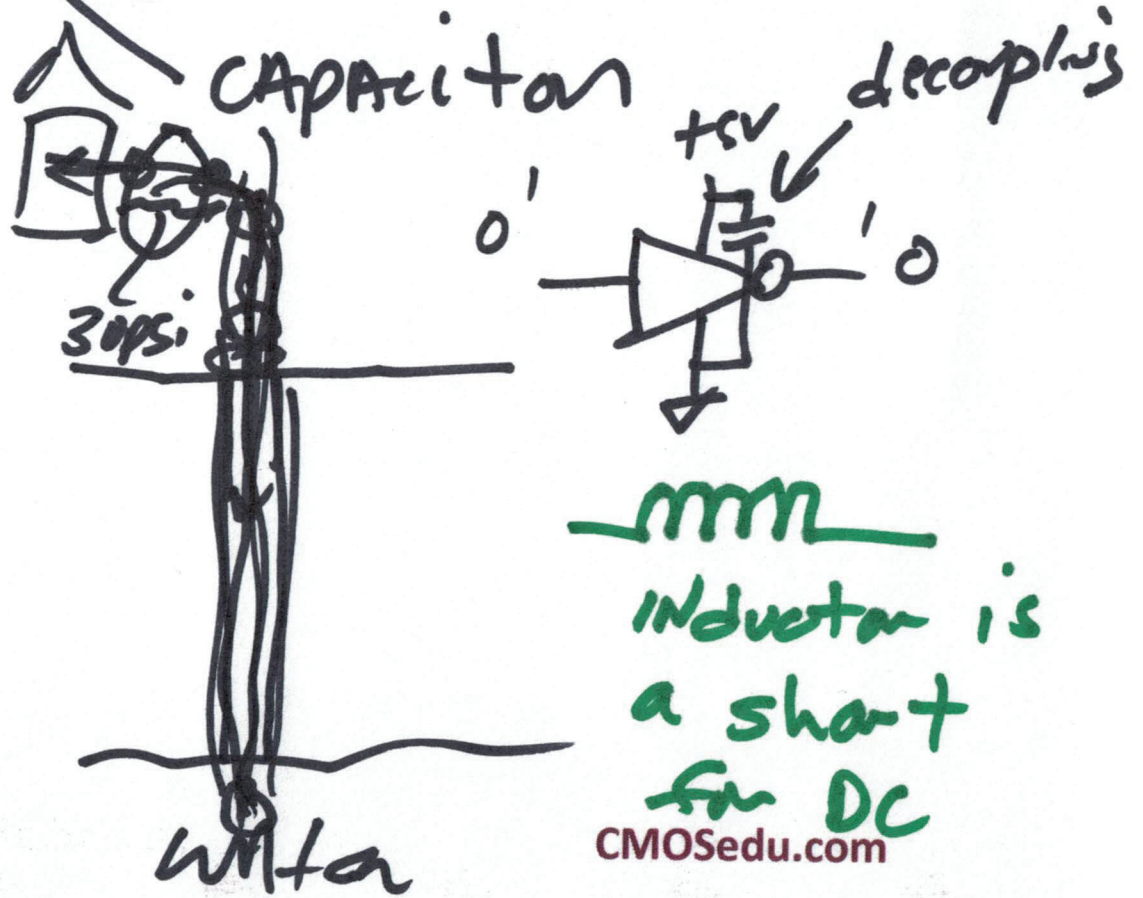
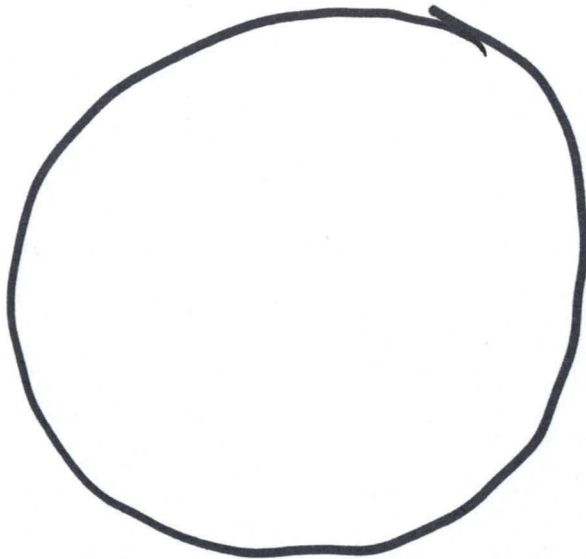
Lecture 14



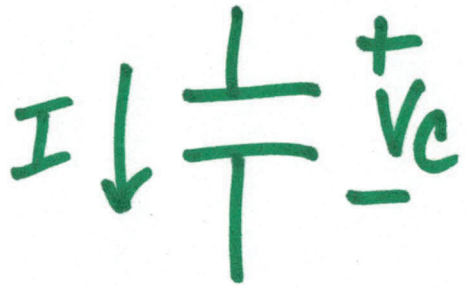


$$\frac{2k}{1k+2k} \cdot 3V = 2V$$

CAP is an open for DC



2)



$$I = C \frac{dV_c}{dt} \quad CV = Q$$

C = CAPACITANCE, Farads

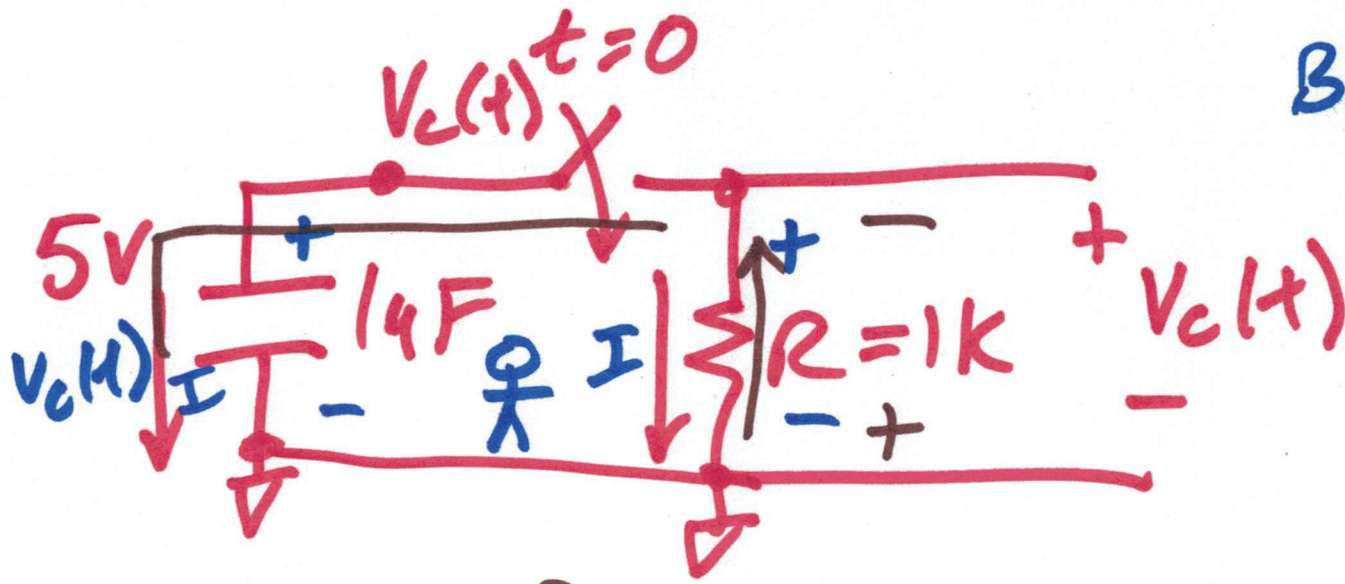
V_c = Voltage across
CAP.

I = current through
the CAP

Boundary conditions

$$V_c(0) = 5V$$

$$V_c(\infty) = 0$$



$$V_c + R \cdot I = 0$$

$$V_c + R \cdot C \frac{dV_c}{dt} = 0$$

$$V_c = -RC \frac{dV_c}{dt}$$
$$\int_0^t \frac{dt}{RC} = \int_{V_c}^{V_c(t)} \frac{dV_c}{V_c}$$

4)

$$\int_0^t -\frac{dt}{RC} = \int_{V_c(0)}^{V_c(t)} \frac{dV_c}{V_c}$$

$$\int_{t_1}^{t_2} dx = x(t_2) - x(t_1)$$

$$\int \frac{dx}{x} = \ln x$$

$$-\frac{1}{RC}(t-0) = \ln V_c \Big|_{V_c(0)}^{V_c(t)}$$

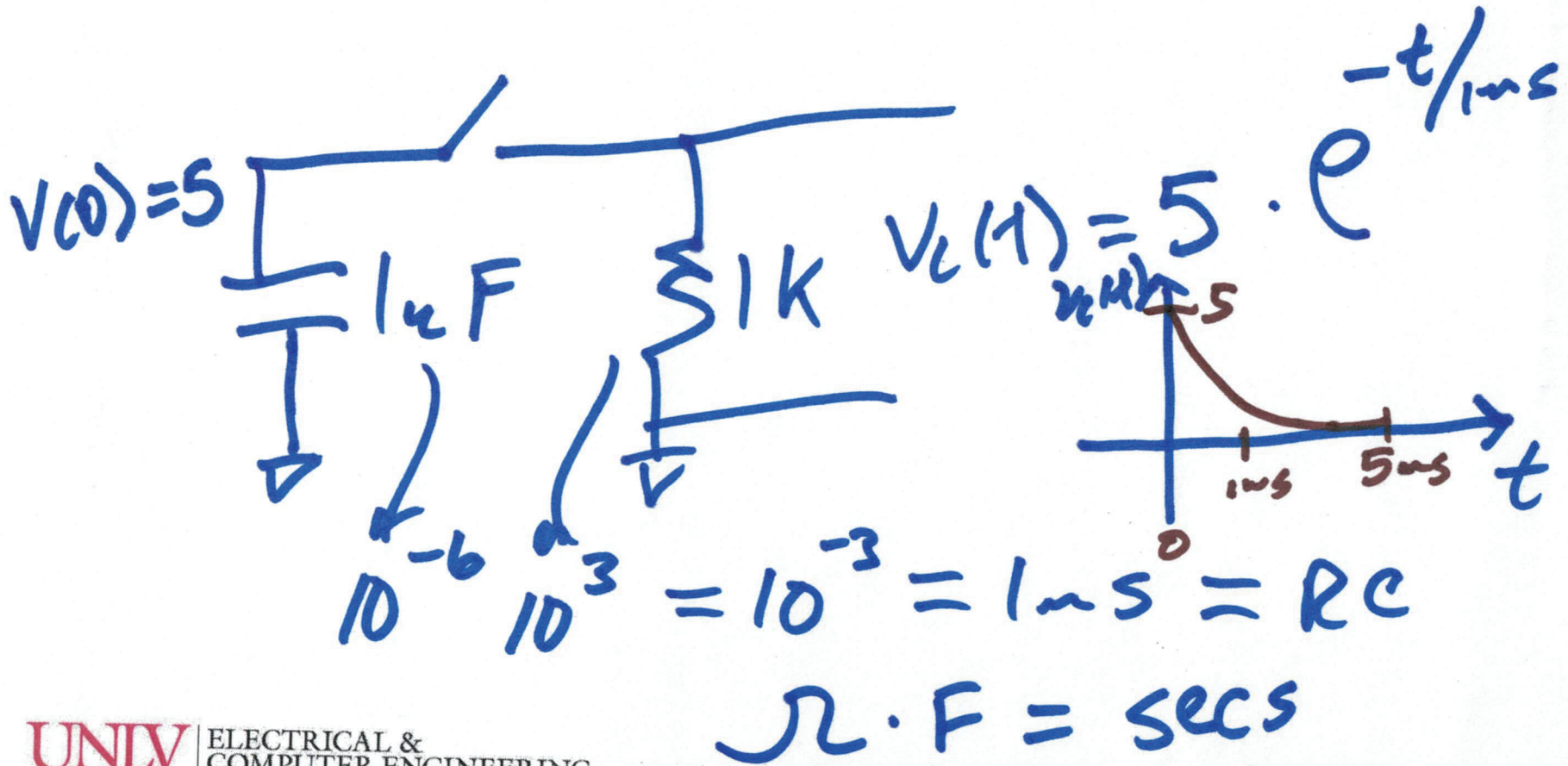
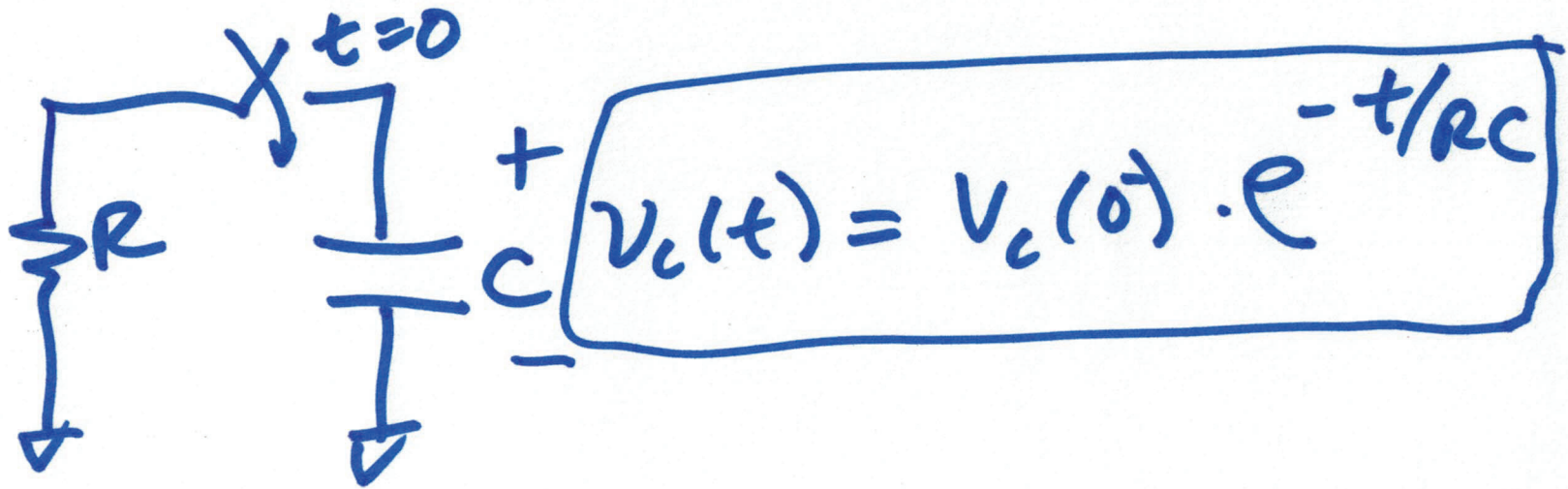
$$\ln a - \ln b = \ln \frac{a}{b}$$

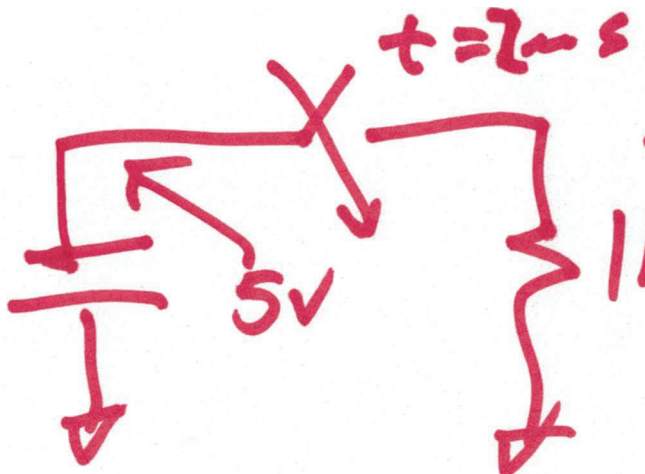
$$= \ln V_c(t) - \ln V_c(0)$$

$$-\frac{t}{RC} = \ln \frac{V_c(t)}{V_c(0)} \rightarrow e^{-t/RC} = \frac{V_c(t)}{V_c(0)}$$

$$V_c(t) = V_c(0) \cdot e^{-t/RC}$$

5)

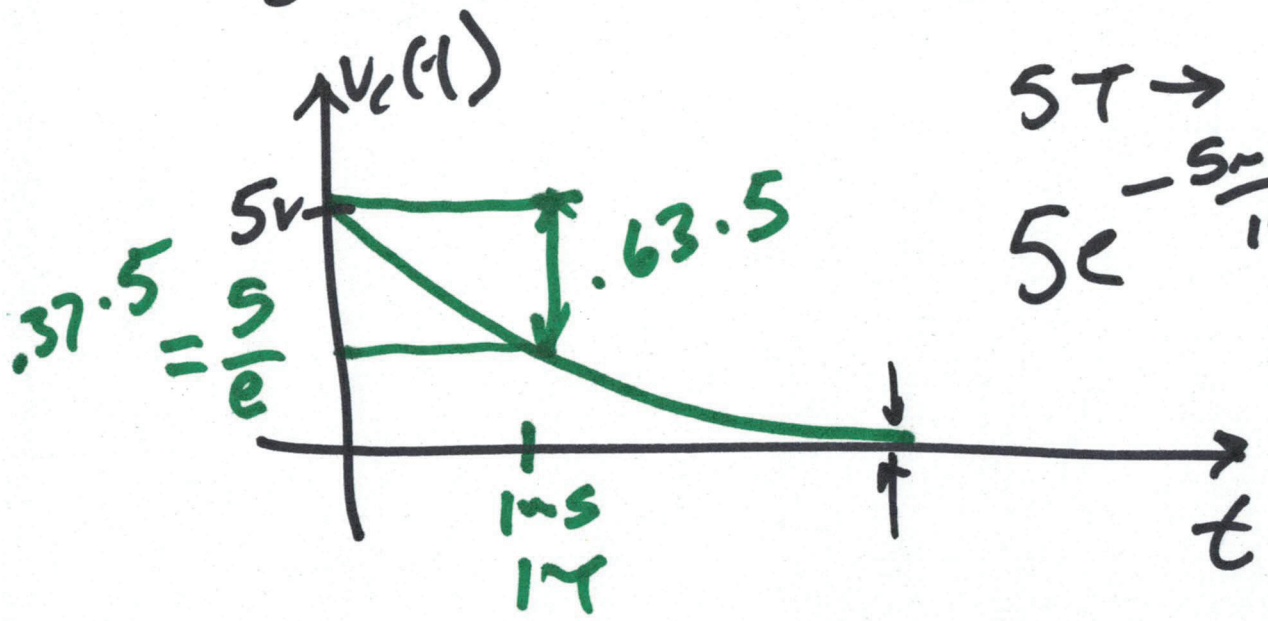




$$V_c(t) = 5e^{-(t-2ms)/1ms}$$

$$t \geq 2ms$$

$$V_c(t) = 5e^{-t/1ms}, \quad t \geq 0ms, \quad RC = 1ms$$

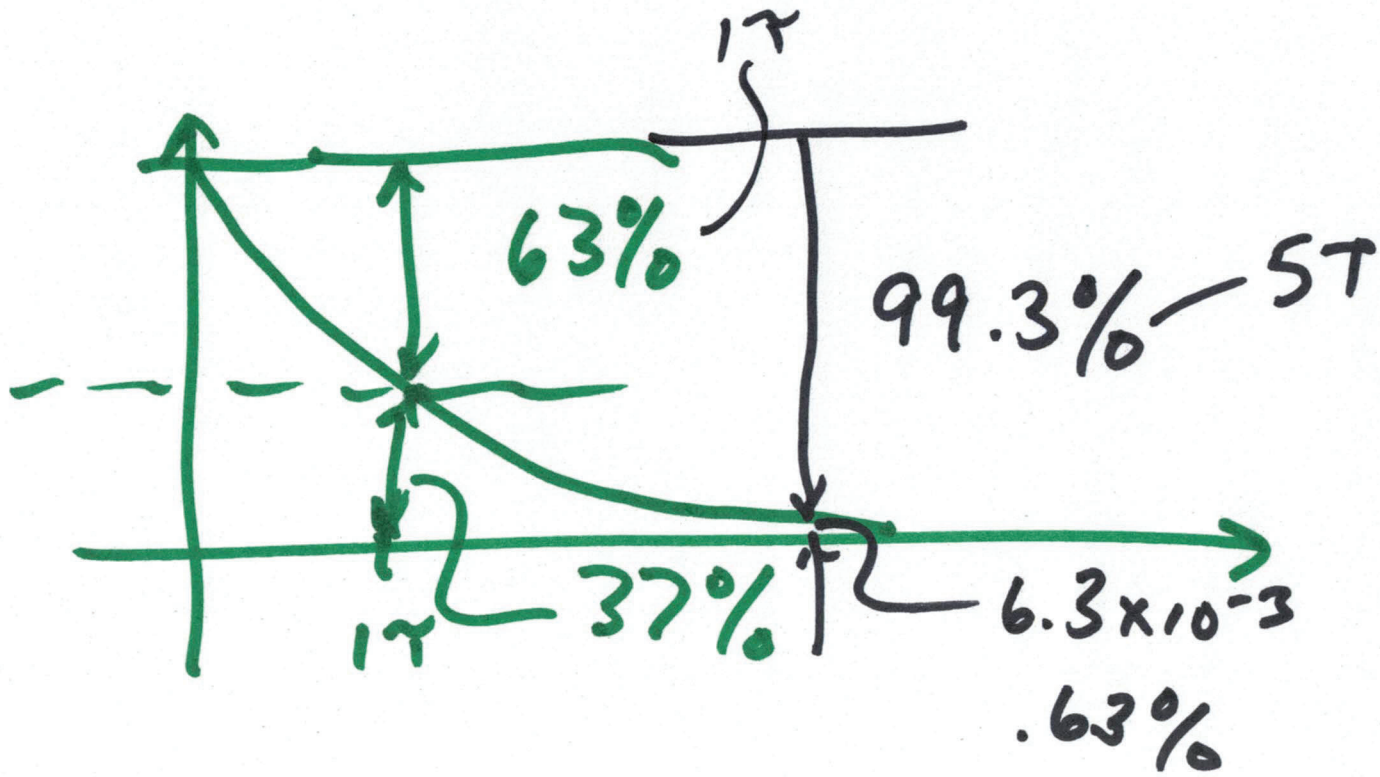


$$5e^{-\frac{5ms}{1ms}}$$

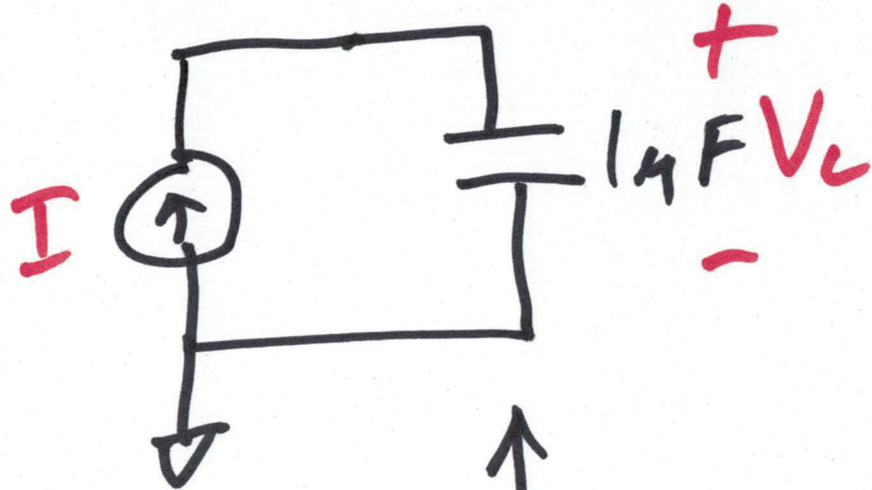
$RC = 1ms$
 time constant

$$= 5e^{-5} = 5.62e^{-3} \approx 0$$

7)



8)



$$\frac{I}{C} = \frac{dv}{dt} = \frac{\Delta V}{\Delta t}$$

$$\Delta V = \Delta t \cdot \frac{I}{C}$$

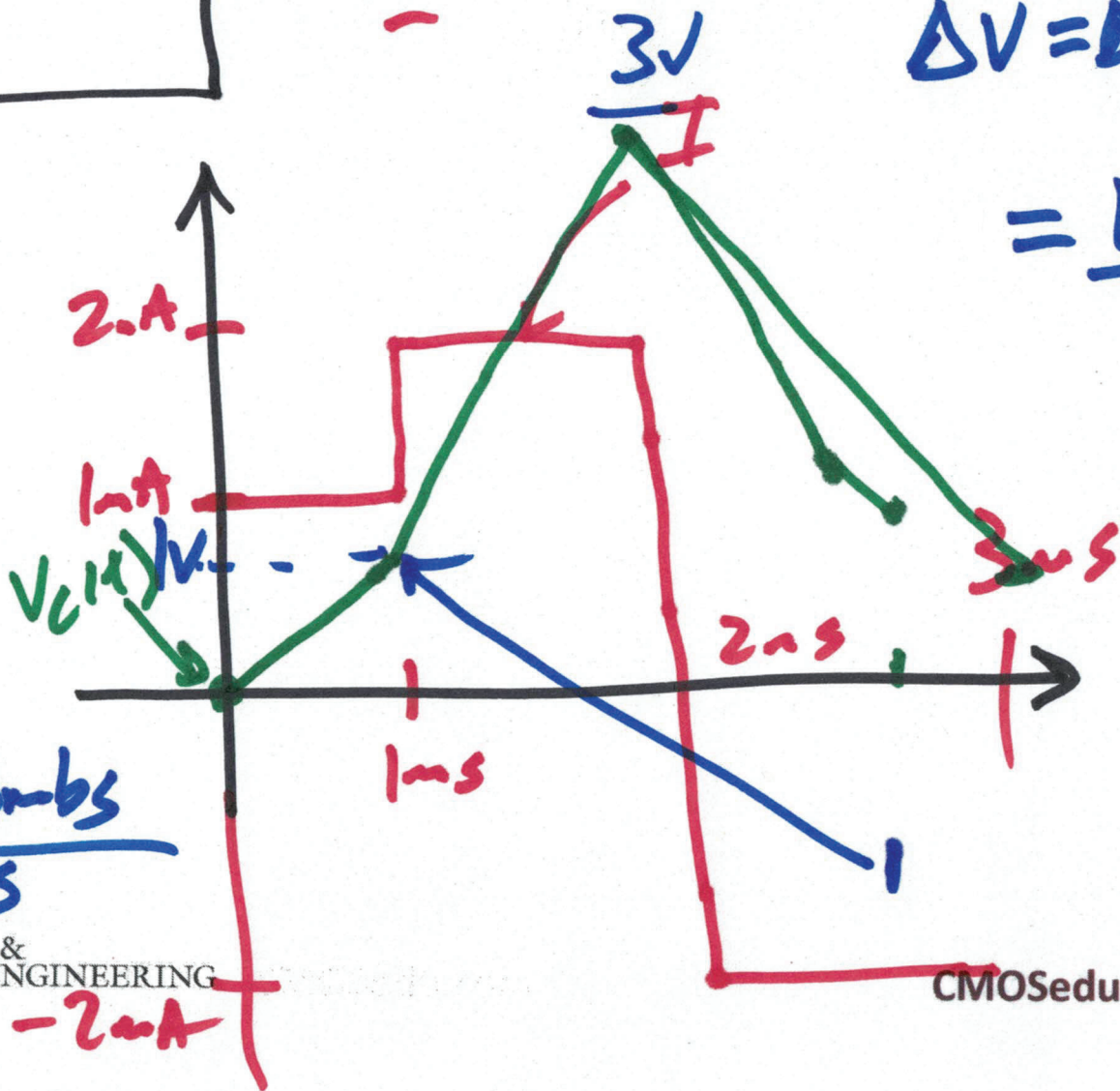
$$= \frac{1ns \cdot 1nA}{1nF}$$

$$\Delta V = 1$$

$$I = C \frac{dv}{dt}$$

F · (V/s)

$$= \frac{\text{Coulombs}}{s}$$



a)