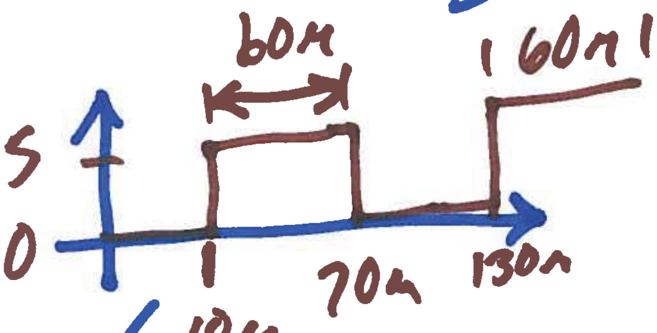
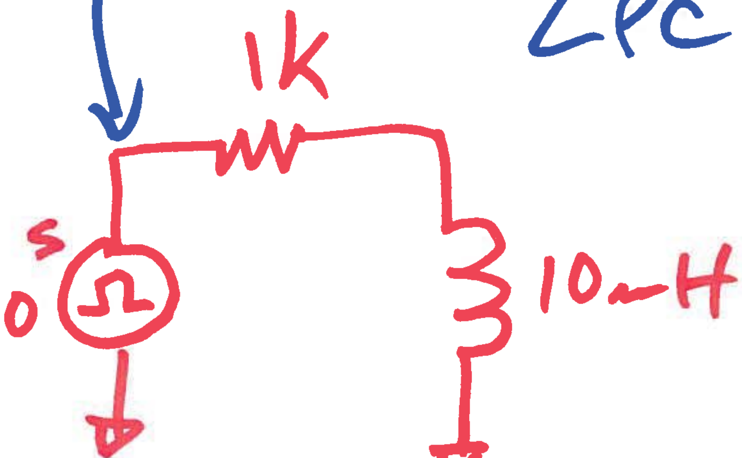
EE 220

Circuits 1

Lecture 20





0 5 10μ 10n 10n 60μ 130m

$$\tau = \frac{L}{R} = \frac{10\,mH}{1k\Omega} = \frac{10\cdot10^{-3}}{1\cdot10^{3}}\cdot\frac{10^{-3}}{10^{-3}} = \frac{10\cdot10^{-6}}{1} = 10\,\mu s$$

octave

$\times 2$

$\div 2$

10 ns vs 10 μs ← 1,000 times faster

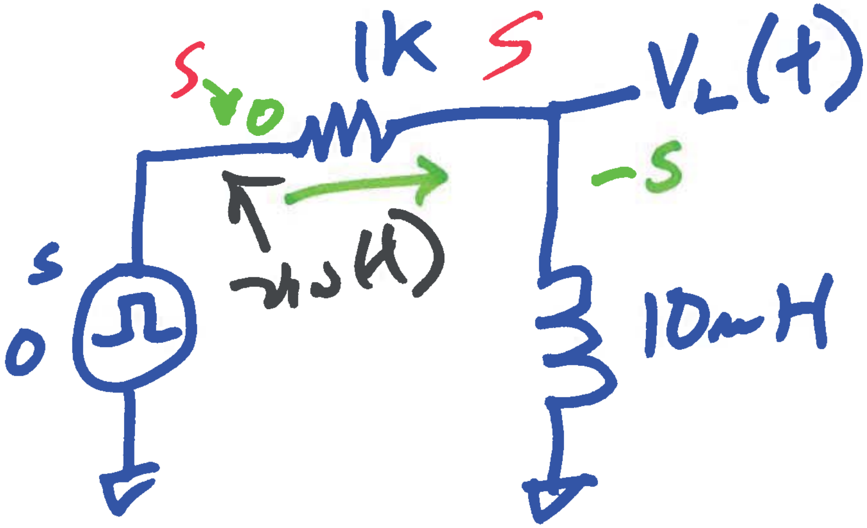
order of magnitude

$\times 10$

$\div 10$

$10\cdot10\cdot10 = 10^3$

three orders of magnitude



$v_i = 5V$

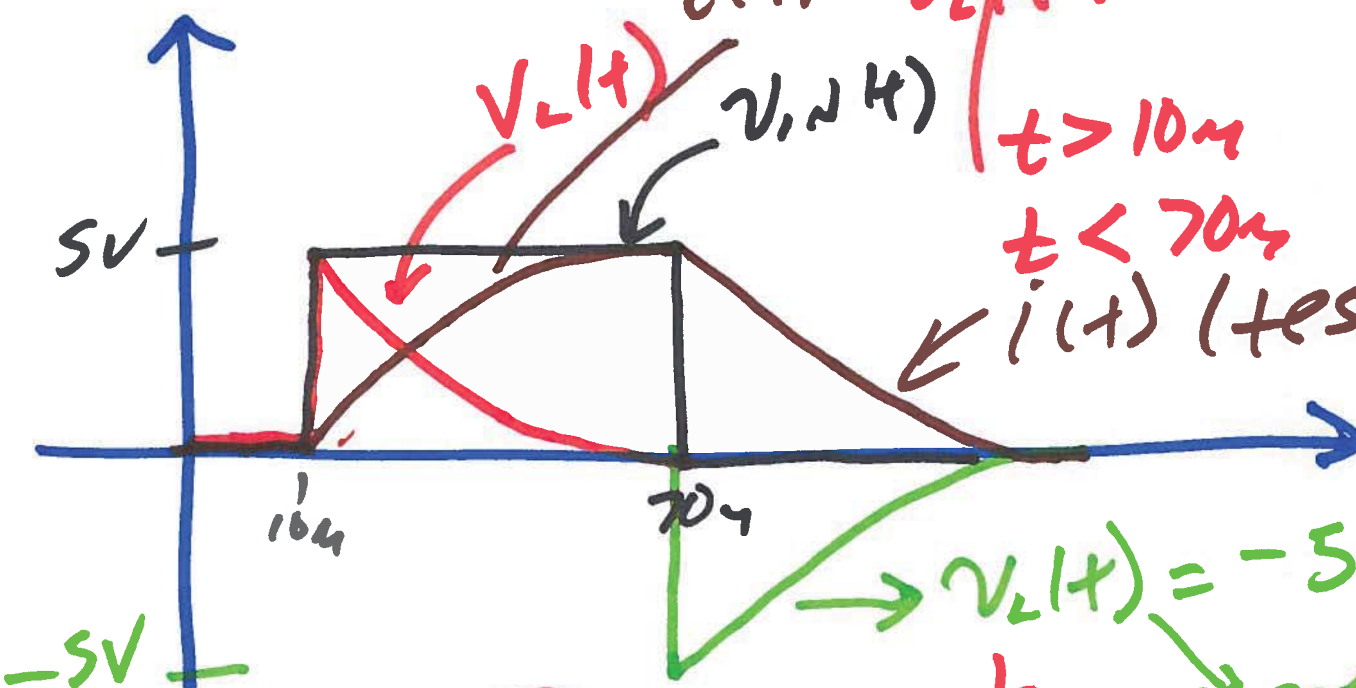
$v_f = 0$

$v_L(t) = 0 + (5-0)e^{-t/L/R}$

$v_L(t) = 5e^{-(t-10\mu)/10\mu}$

$t > 10\mu$

$t < 70\mu$



$i(t)$ (test?!)

$v_L(t) = -5e^{-(t-70\mu)/10\mu}$

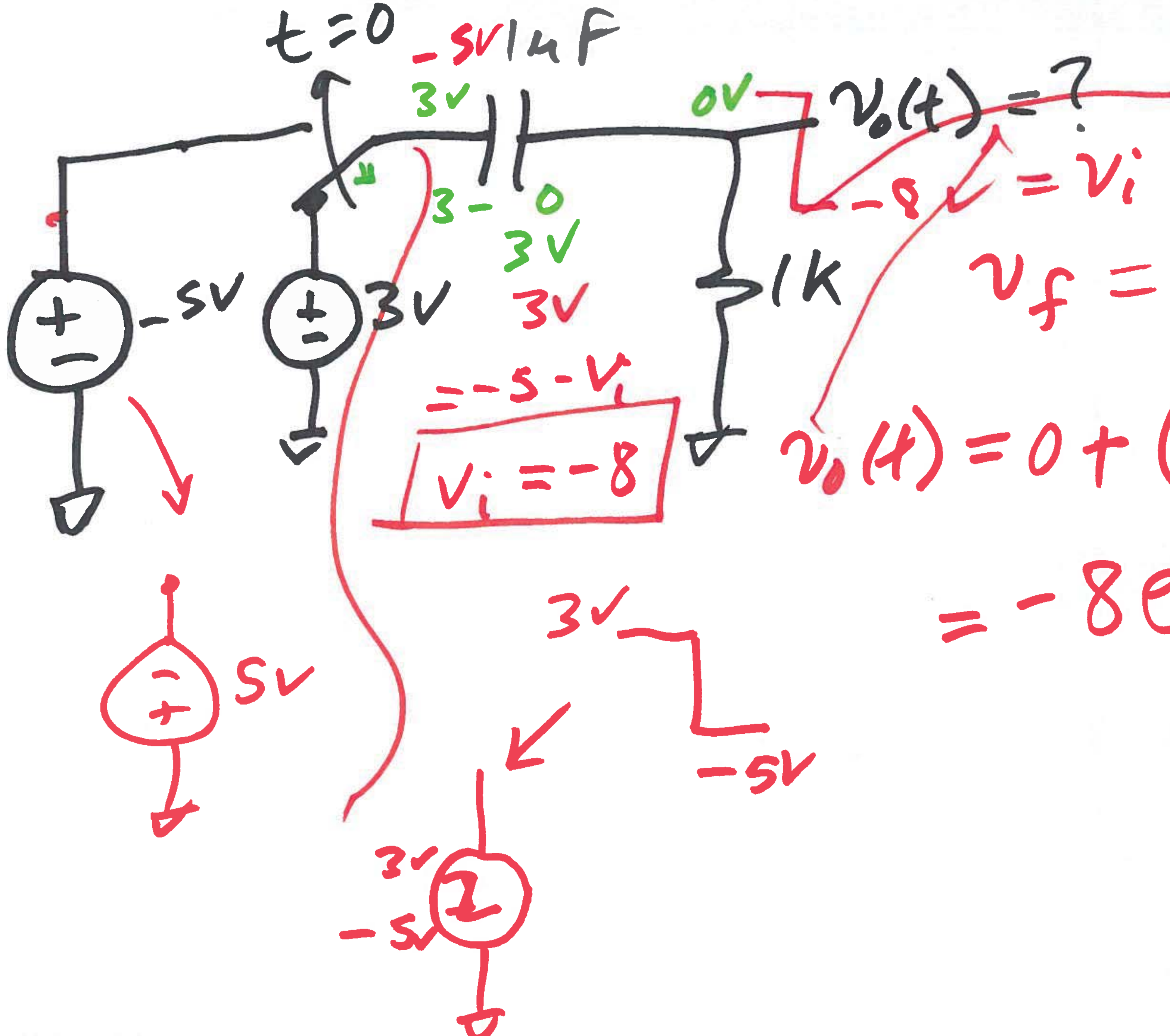
$70\mu < t < \infty$

$\tau = 10\mu = \frac{L}{R}$

UNLV | ELECTRICAL & COMPUTER ENGINEERING

CMOSedu.com

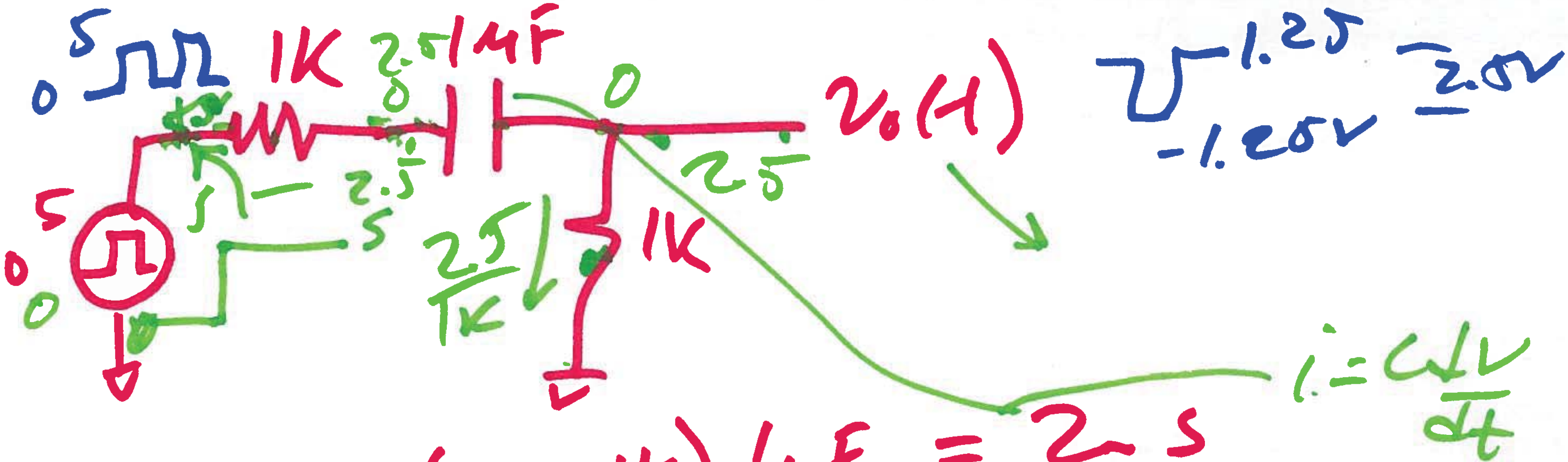
2)



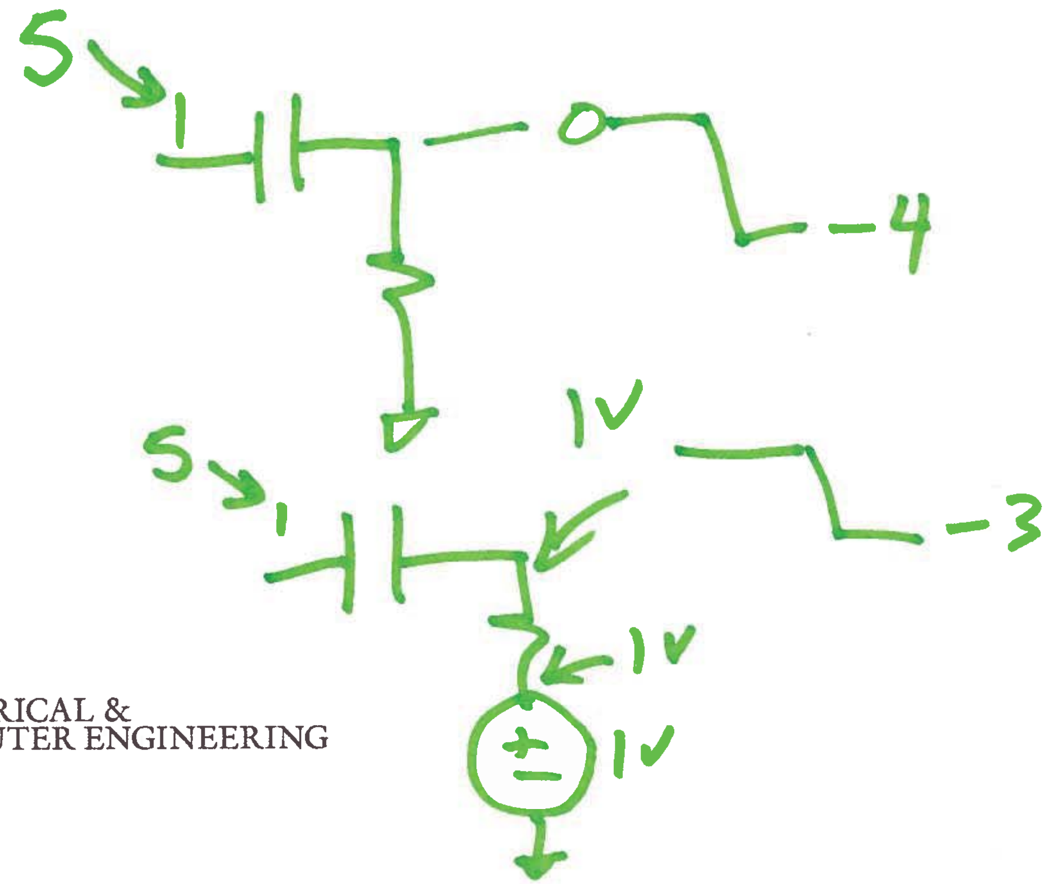
$v_f = 0$

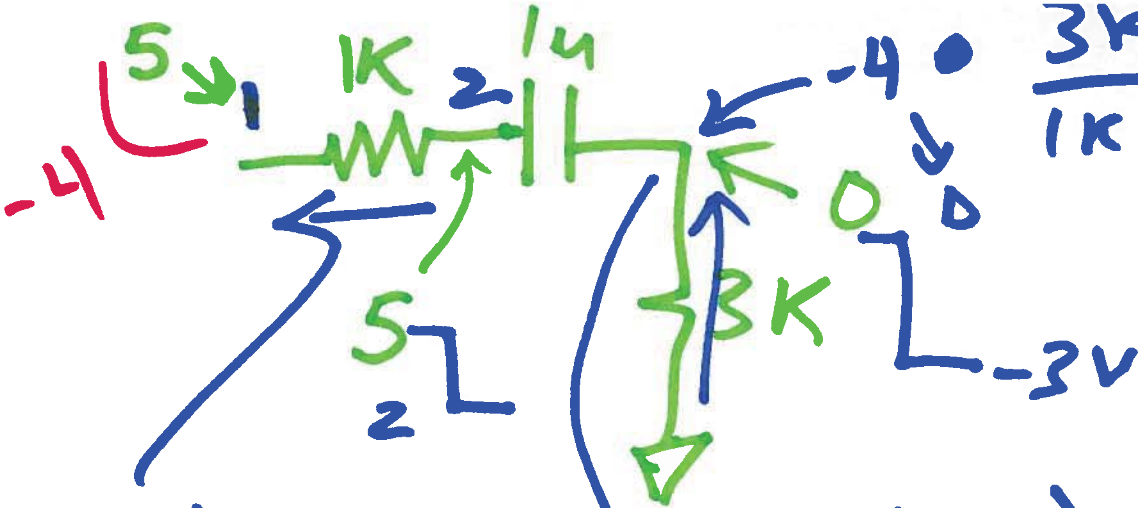
$v_0(t) = 0 + (-8-0)e^{-t/1ms}$

$= -8e^{-t/1ms}$



$$\tau = (1k + 1k)\cdot .1uF = 2\ ms$$

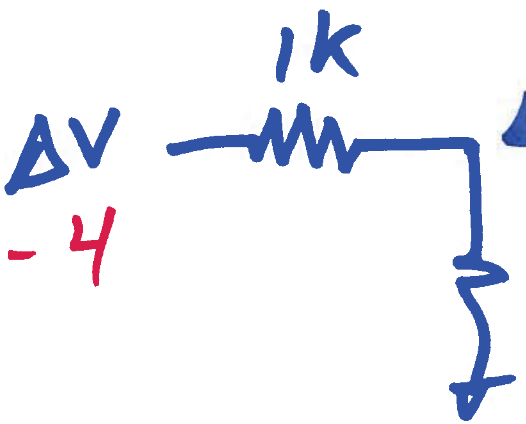




$$-4 \cdot \frac{3K}{1K+3K} = -3V$$

$$\frac{2-1}{1K} = 1mA$$

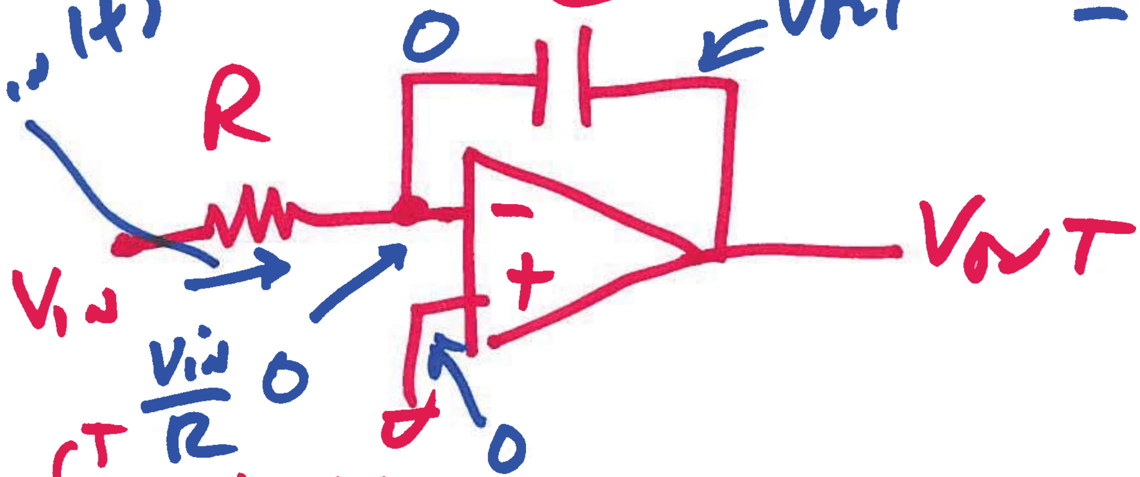
$$\frac{0-(-3V)}{3K} = 1mA$$



$$\Delta V \cdot \frac{3K}{1K+3K} = \Delta V \cdot \frac{3}{4}$$

$$-4 \cdot \frac{3}{4} = -3V$$

Integrator



$$i_{in}(t) = \frac{V_{in}}{R}$$

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

$$= C\cdot\frac{dV_{out}}{dT}$$

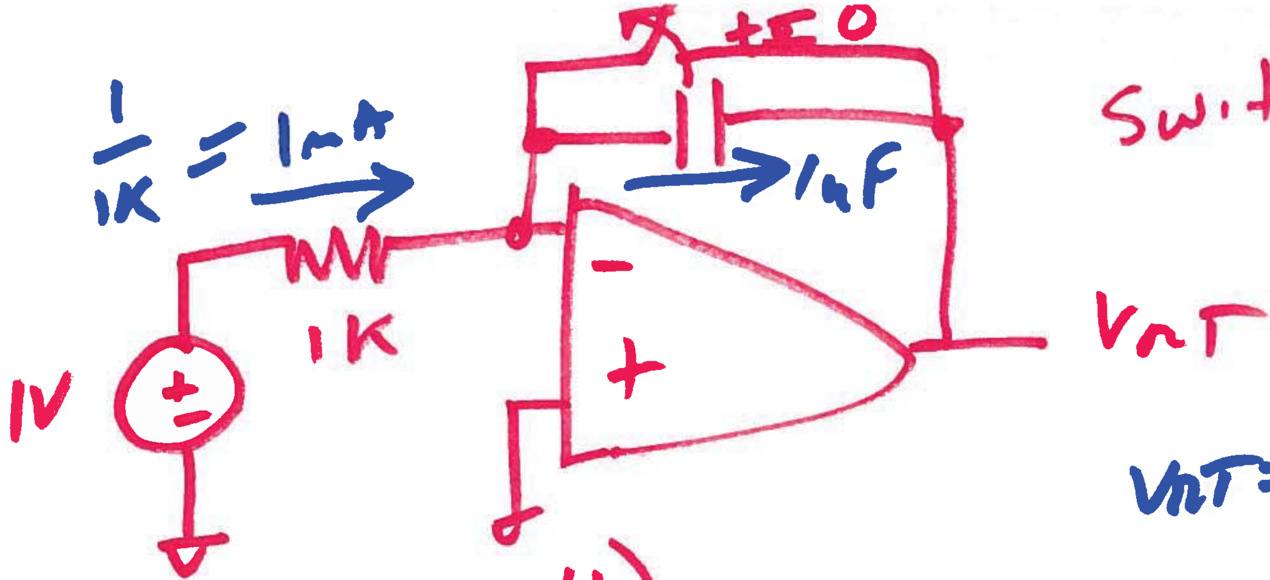
$$= -\frac{1}{C}\cdot\int_0^T i_{in}(t)\cdot dt$$

$$\frac{V_{in}}{R} + C\frac{dV_{out}}{dt} = 0$$

$$V_{in} = -RC\cdot\frac{dV_{out}}{dt}$$

$$\int_0^t V_{in}\cdot dt = -RC\int_0^{V_{out}} dV_{out}$$

$$V_{out} = -\frac{1}{RC}\int_0^t V_{in}\cdot dt$$



Switch opens at t=0

$$V_{OUT} = \frac{-1}{1K \cdot 1\mu} \int_0^t 1 \cdot dt$$

$$= -\frac{1}{10^{-3}} \cdot 1V \cdot t$$

$$= -\frac{1V}{1ms} \cdot t$$