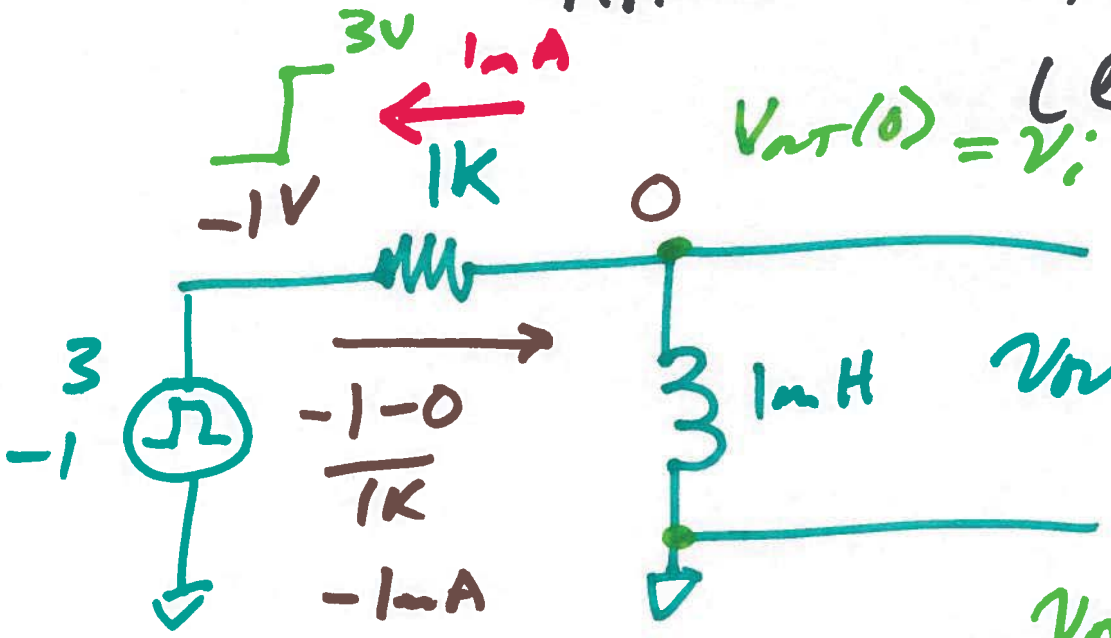
EE 221 Circuits II

March 27, Lecture 15



$v_f = 0$

$v_i = 4V$

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

$= 0 + (4-0)e^{-t/\tau}$

$= 4e^{-t/\tau}$

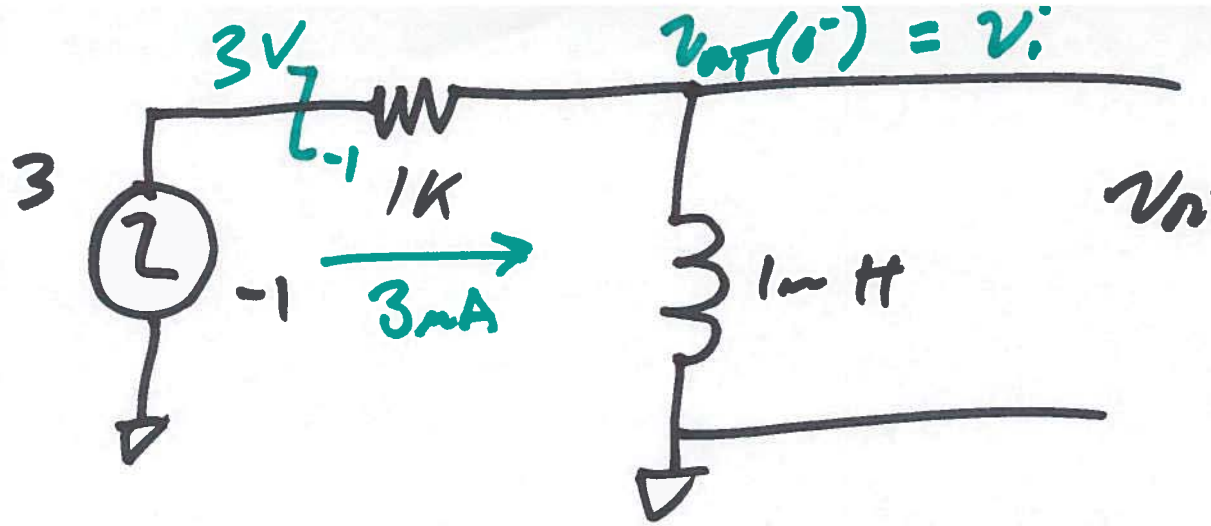
$\tau = L/R$

$v_i - 3 = 1mA \cdot 1K$

$3 - v_i = (-1mA) \cdot 1K$

$v_{OUT}(t) = 0 \quad t < t_0$

$v_{OUT}(t) = 4e^{-(t-t_0)/\tau} \quad t > t_0$



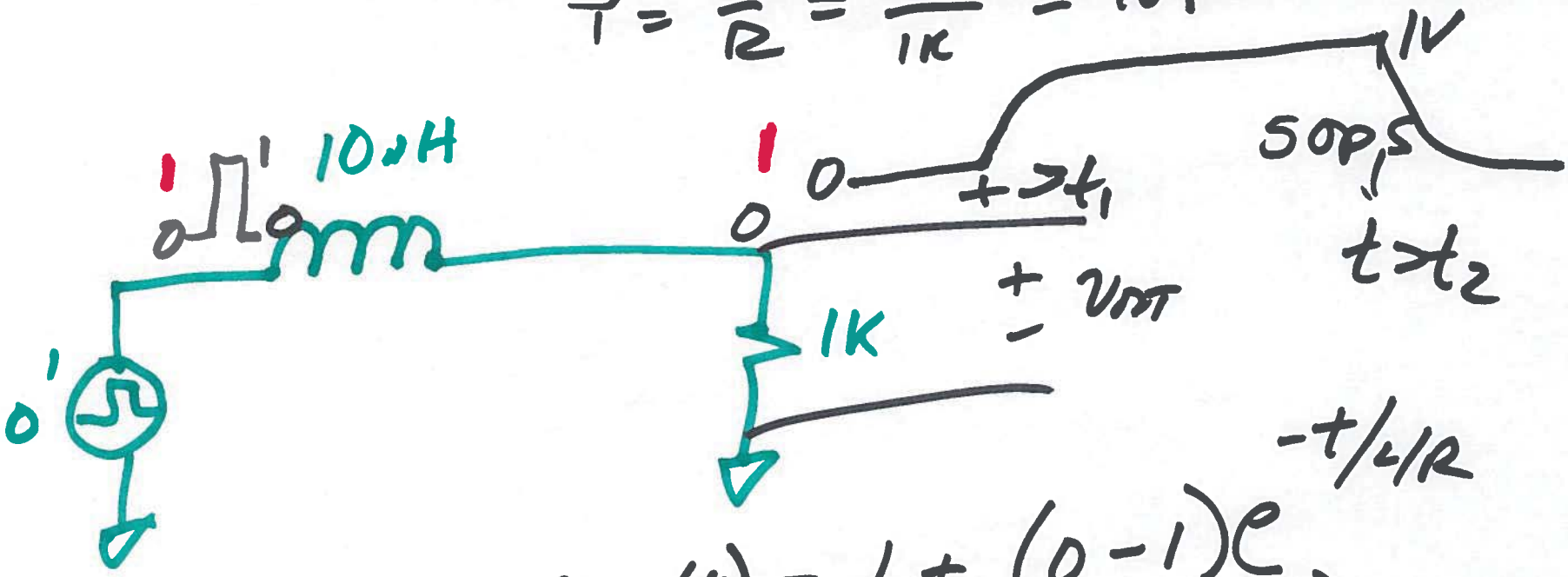
$$-1 - v_i = 3\text{mA} \cdot 1\text{K}$$

$$(v_i = -4V)$$

$$v_{OUT}(t) = -4e^{-\frac{(t-10\mu)}{1\mu}}$$

$$t \geq 10\mu$$

$$\tau = \frac{L}{R} = \frac{10N}{1K} = 10ps$$

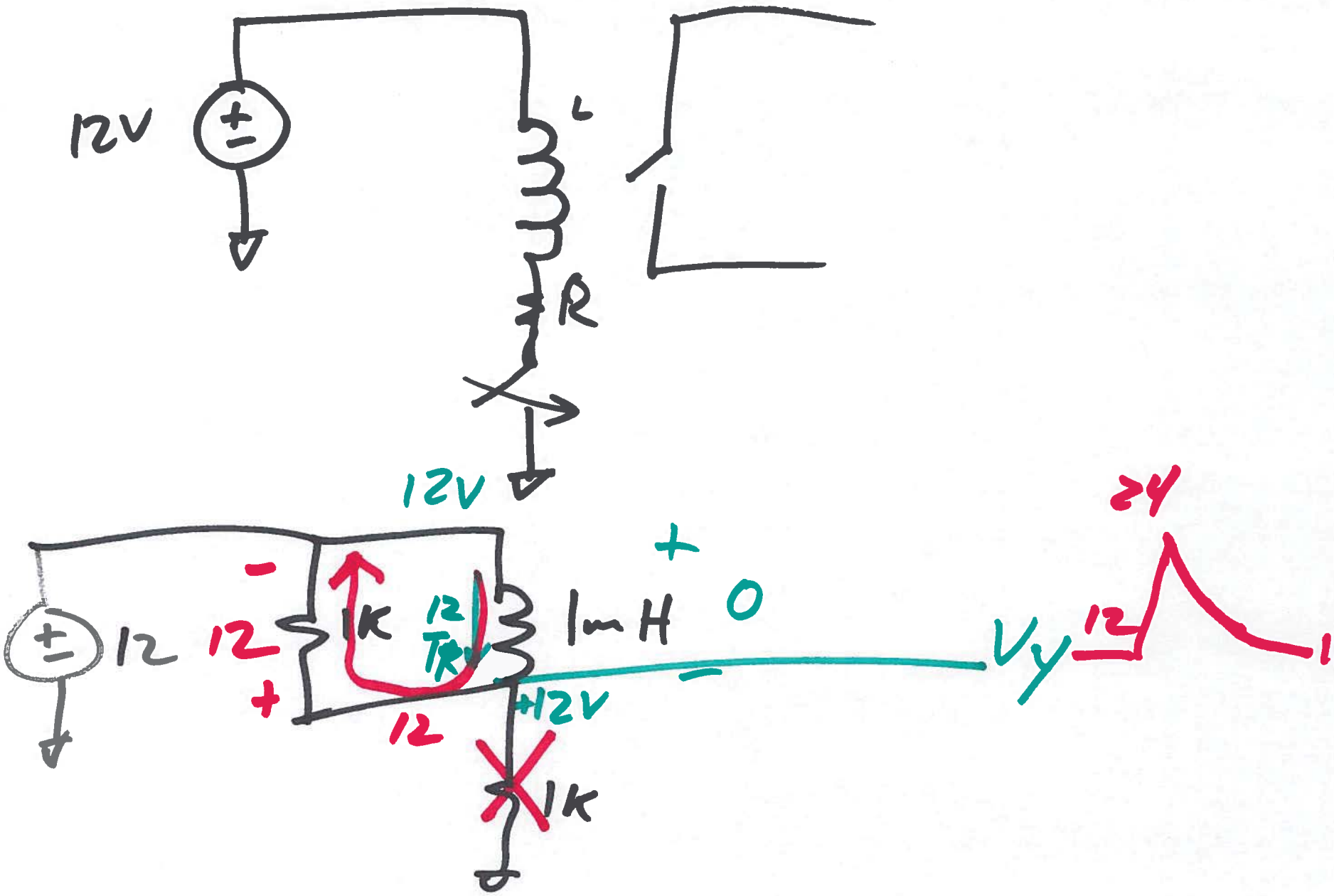


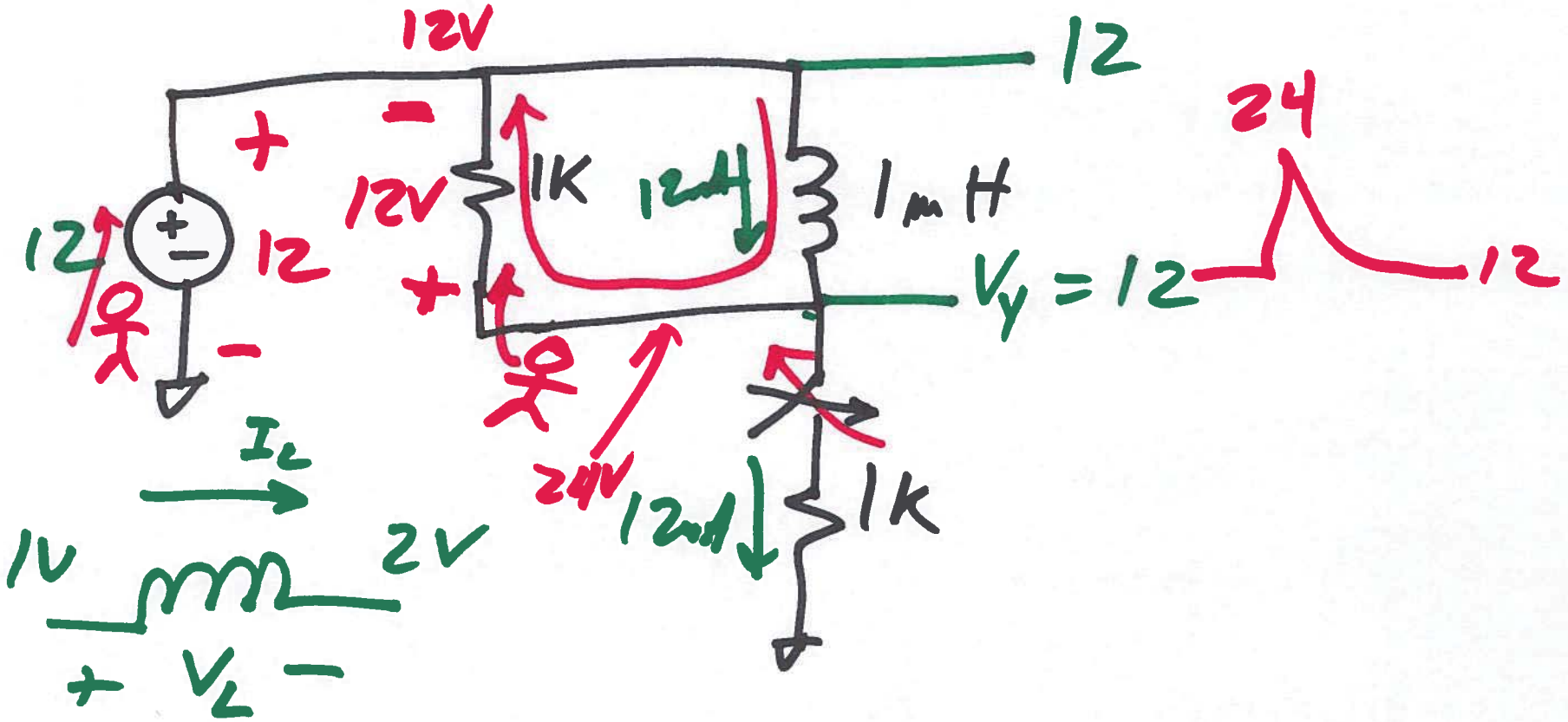
$$v_{out}(t) = 1 + (0-1)e^{-t/L/R}$$

$$= 1\left(1 - e^{-(t-t_1)/L/R}\right)$$

$t_2 > t_1$

$$v_{out}(t) = 1e^{-(t-t_2)/L/R} \quad t > t_2$$

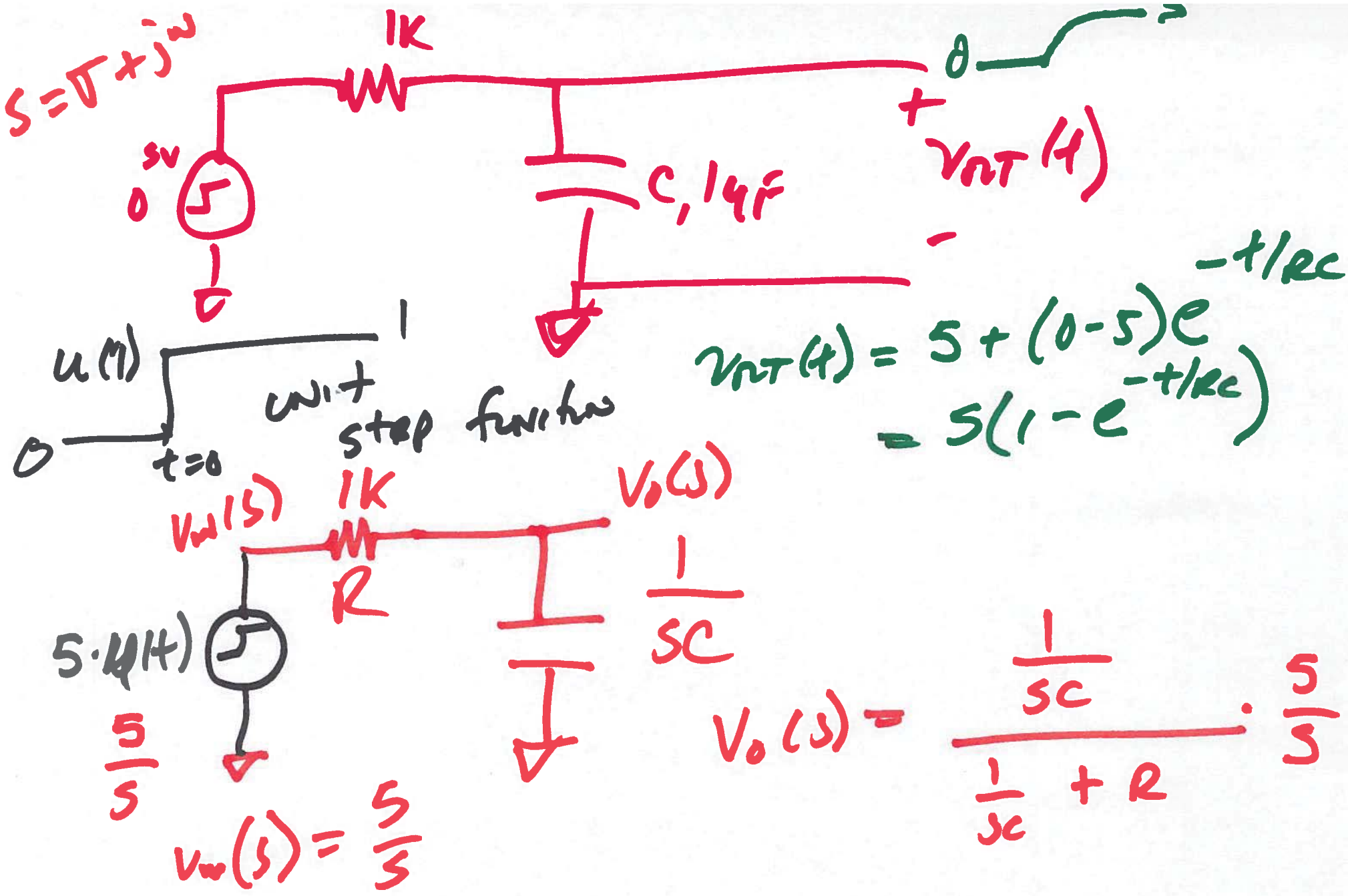

12V
L
R
12V
12
12
1K
12
1mH
0
+12V
1K
24
12
Vy



$$V_L = L \cdot \frac{dI_L}{dT}$$

$$1 - 2 = -1 = V_L = L \cdot \frac{dI_L}{dt}$$

5)


$s = \sigma + j\omega$
1K
0
5V
C, 1μF
+
$v_{RT}(t)$
-
u(t)
1
0
t=0
unit step function
$V_{in}(s)$
1K
R
$V_o(s)$
$\frac{1}{sC}$
5·u(t)
$\frac{5}{s}$
$V_{in}(s) = \frac{5}{s}$
$v_{RT}(t) = 5 + (0-5)e^{-t/RC}$
$= 5(1 - e^{-t/RC})$
$V_o(s) = \frac{\frac{1}{sC}}{\frac{1}{sC} + R} \cdot \frac{5}{s}$

$$V_o(s) = \frac{1}{1+sRC} \cdot \frac{5}{s}$$

$$= \frac{A}{1+sRC} + \frac{B}{s}.$$

Partial Fraction expansions

$$s \cdot V_o(s) = \frac{A \cdot s}{1+sRC} + B$$