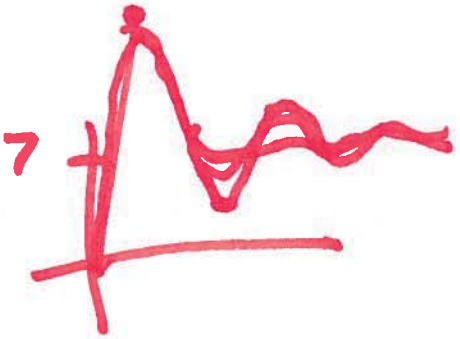
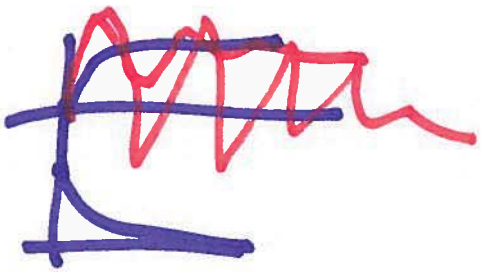
EE 220
Circuits 1

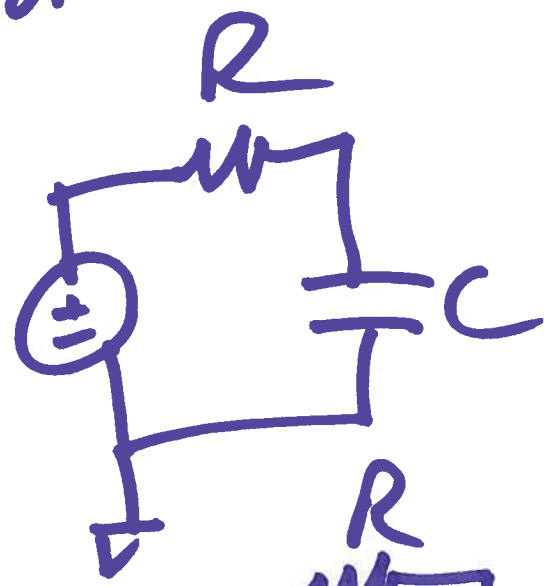


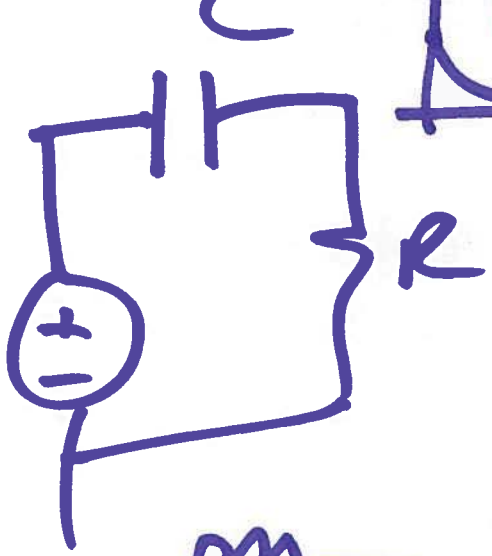
Lecture 17

first-order circuits have "1" CAP or inductor.



Ex

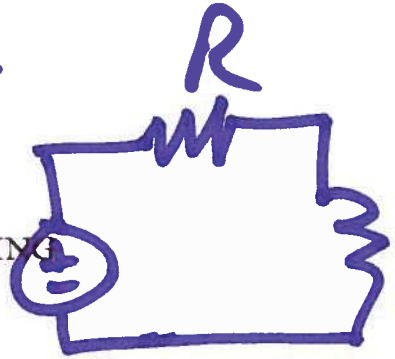


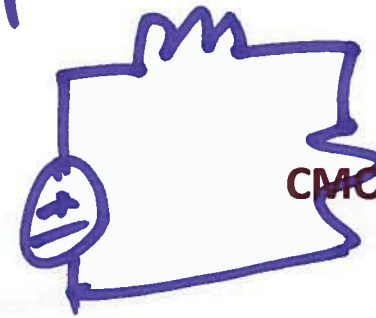


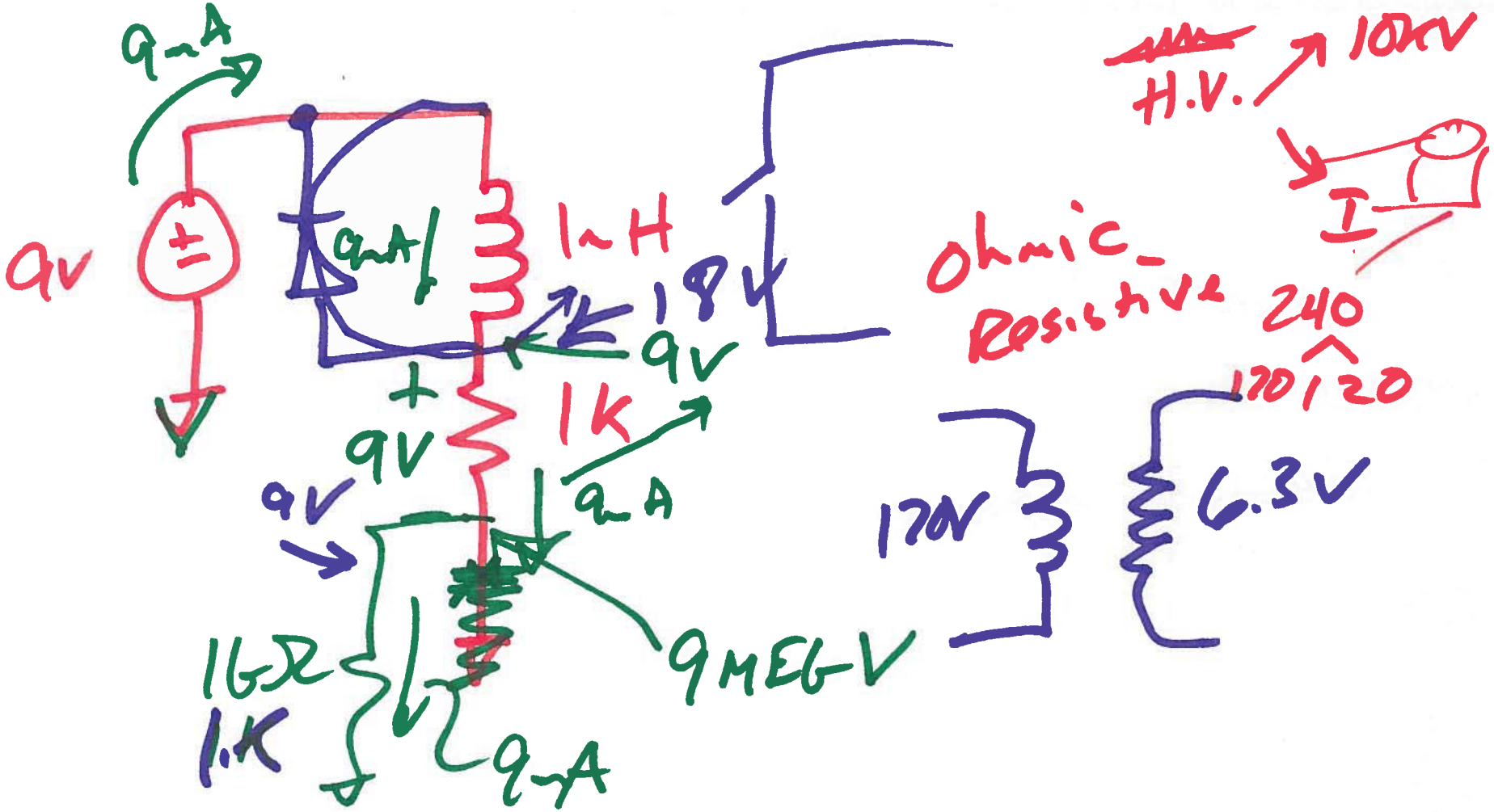
second-order

& inductor

& CAP

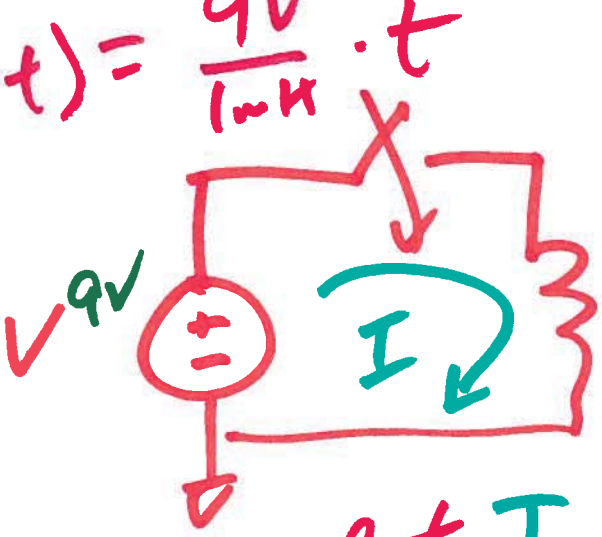


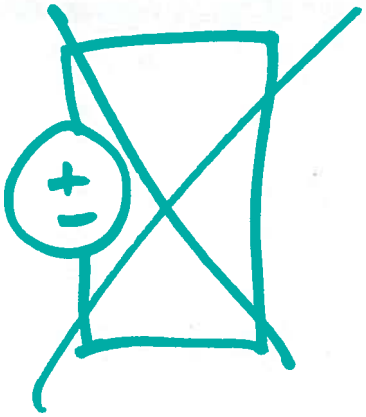



9mA
9V
9mA
1mH
18V
9V
+
9V
1K
9V
9mA
1GΩ
1K
9mA
9MEG-V
H.V.
10KV
I
Ohmic-
Resistive
240
120/120
120V
6.3V

$$i(t) = \frac{9V}{1mH} \cdot t$$

$$\frac{10^{-3}}{10^{-3}} \cdot \frac{9A}{ms} = \frac{9mA}{ms}$$





3ms

$$i(t) = \frac{1}{1mH} \cdot 9 \cdot t$$

I

1ms

$$V = L \cdot \frac{dI}{dt}$$

$$\frac{V}{L} = \text{slope} = \frac{dI}{dt}$$

$$I = \frac{1}{L} \int_{t_1}^{t_2} V \cdot dt + I(0^-)$$

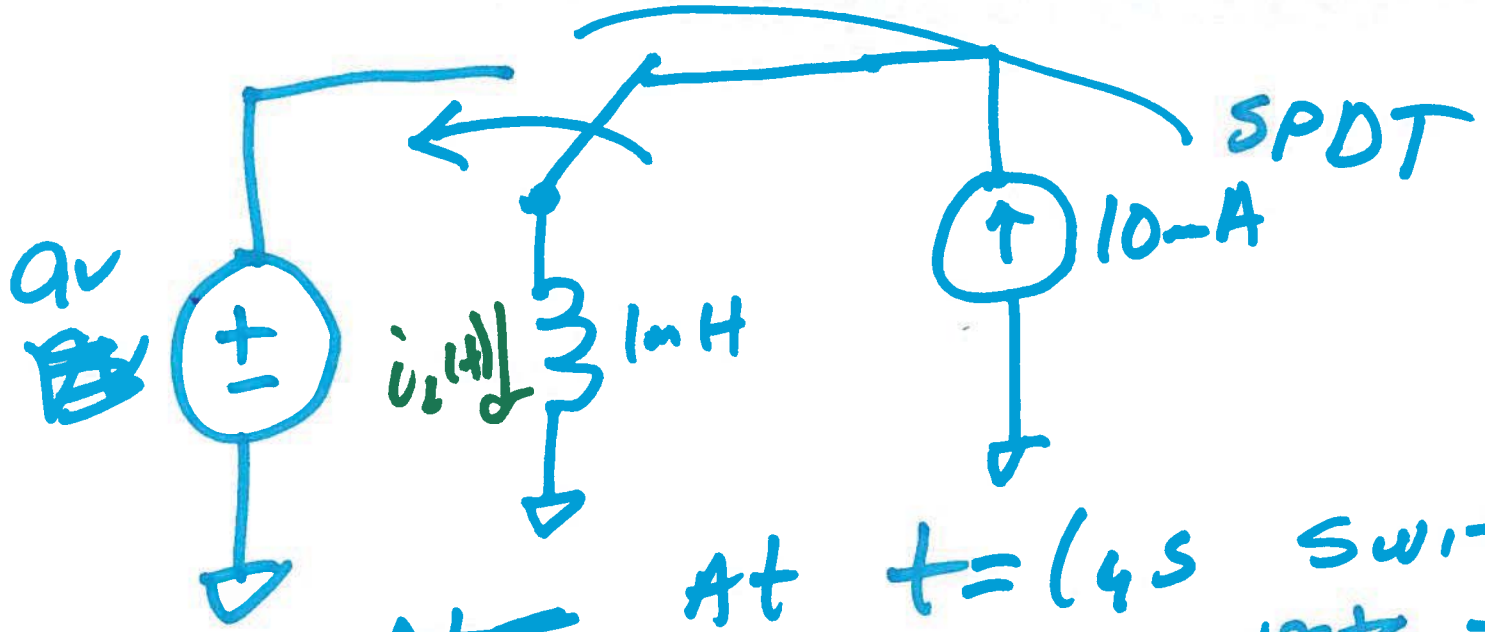
t_2 2ms

t_1 0

$$\int_0^{2ms} 9V \cdot dt$$

t

$$\frac{V}{1mH} = \frac{9V}{1mH} = \frac{9mA}{4s} = \frac{9A}{ms}$$



At $t = 1\,\mu s$ switch connects to Voltage Source

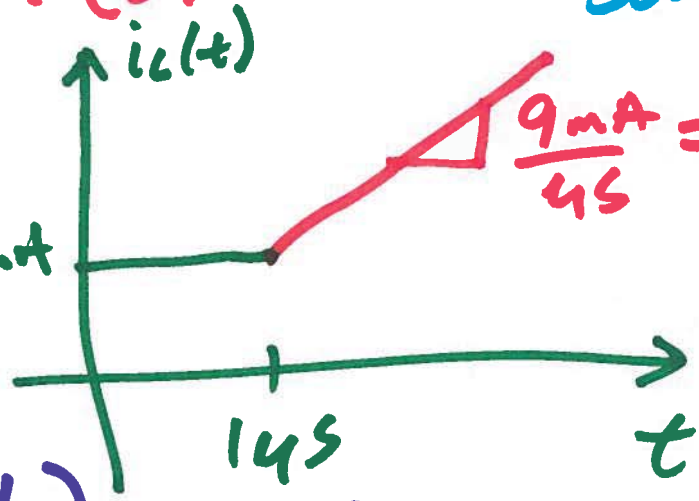
$$i(t) = \frac{1}{L}\int_{t_1}^{t_2} v_L(t)\cdot dt + i(0^-)$$

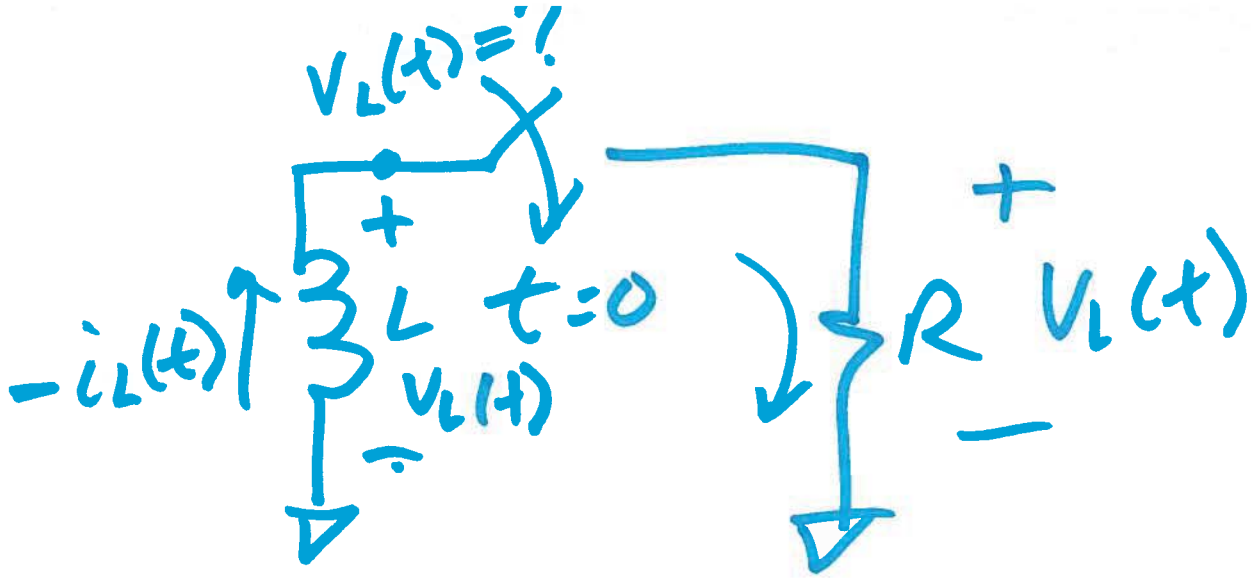
$t_1 = 1\,\mu s$, $t_2 = t$, $i(0^-) = 10\,mA$

$$\frac{9V}{\mu s} = \frac{9V}{1mH} = \frac{9\,mA}{1\,\mu s}$$

$$= \frac{1}{1mH}\,9\cdot t\,\Big|_{1\mu s}^{t} + 10mA$$

$$i(t) = \frac{9mA}{\mu s}(t - 1\mu s) + 10mA \qquad t > 1\,\mu s$$





$$V_L(t) = L \cdot$$

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

$$\frac{V_L(t)}{R} = i_L(t) =$$

$$V_L(t) = L \cdot \frac{di_L(t)}{dt}$$

$$\frac{L}{R} \cdot \frac{di_L(t)}{dt} = -i_L(t)$$

$$= \int_{I_{init}}^{i_L(t)} \frac{di_L(t)}{i_L(t)} = \int_0^t -\frac{R}{L} \cdot dt = -\frac{R}{L} \cdot t$$