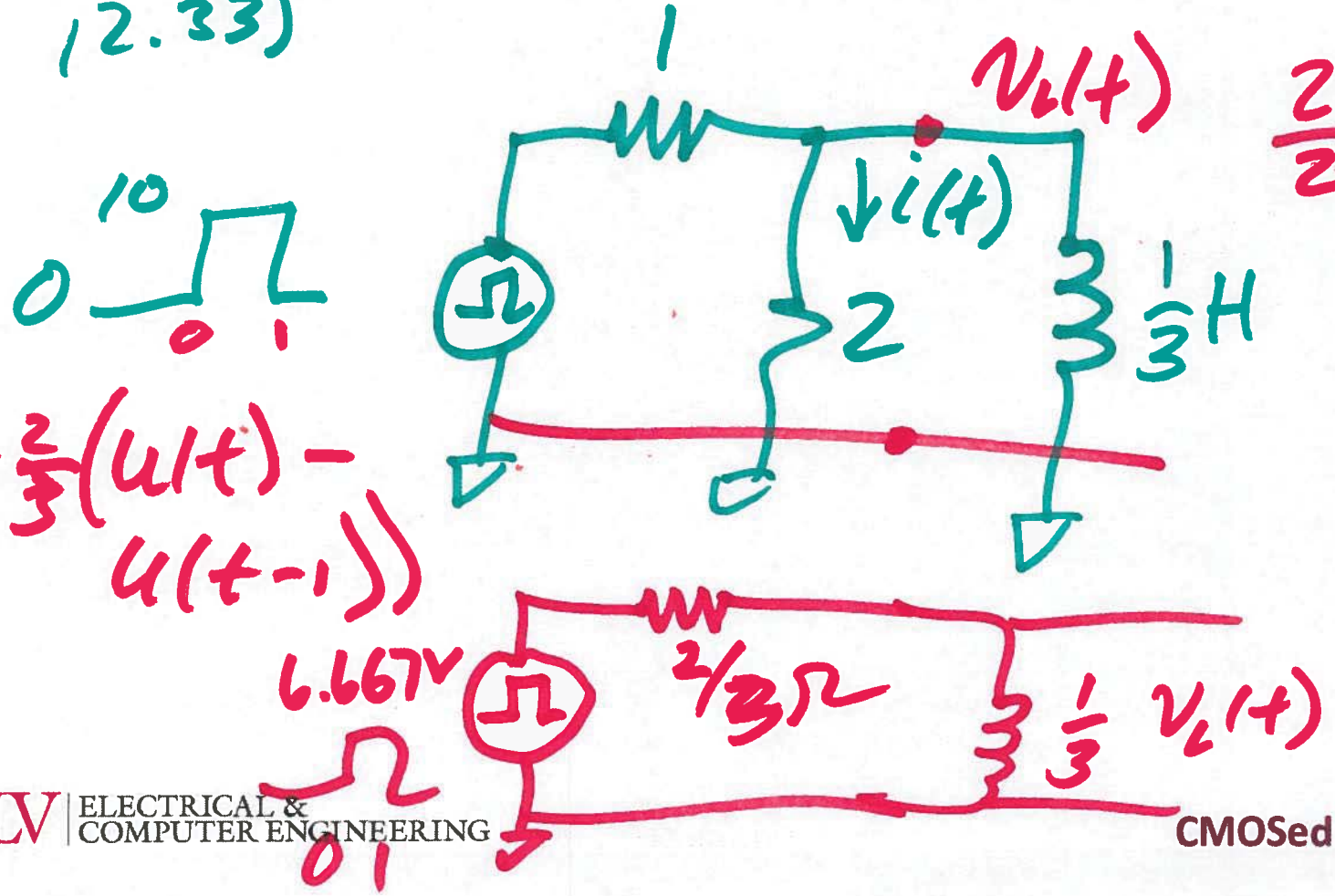
EE221 Circuits II

April 24, 2019

Lecture 22

$i(t) = \frac{v_L(t)}{2}$

12.33)



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

1)

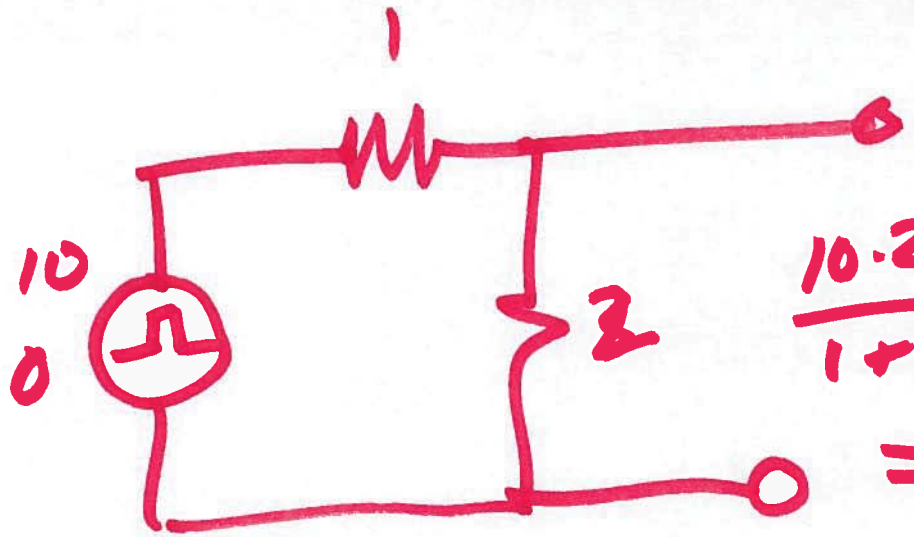
$$= \frac{20}{3}\left(\frac{1}{s} - \frac{e^{-s}}{s}\right) \cdot \frac{s/3}{s/3 + 2/3} = \frac{s}{s+2}$$

$$V_L(s) = \frac{20}{3} \cdot \frac{1}{s+2} - \frac{20}{3}\frac{e^{-s}}{s+2}$$

$$v_L(t) = \frac{20}{3}\left(e^{-2t}\cdot u(t) - e^{-2(t-1)}\cdot u(t-1)\right)$$

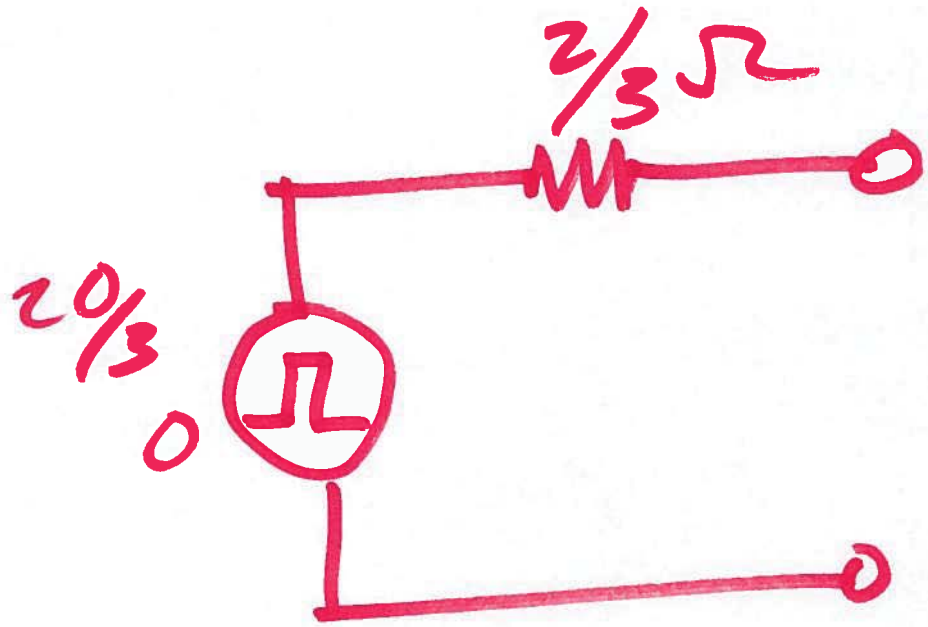
$$i(t) = \frac{20}{6}\left(e^{-2t}\cdot u(t) - e^{-2(t-1)}\cdot u(t-1)\right)$$

2)

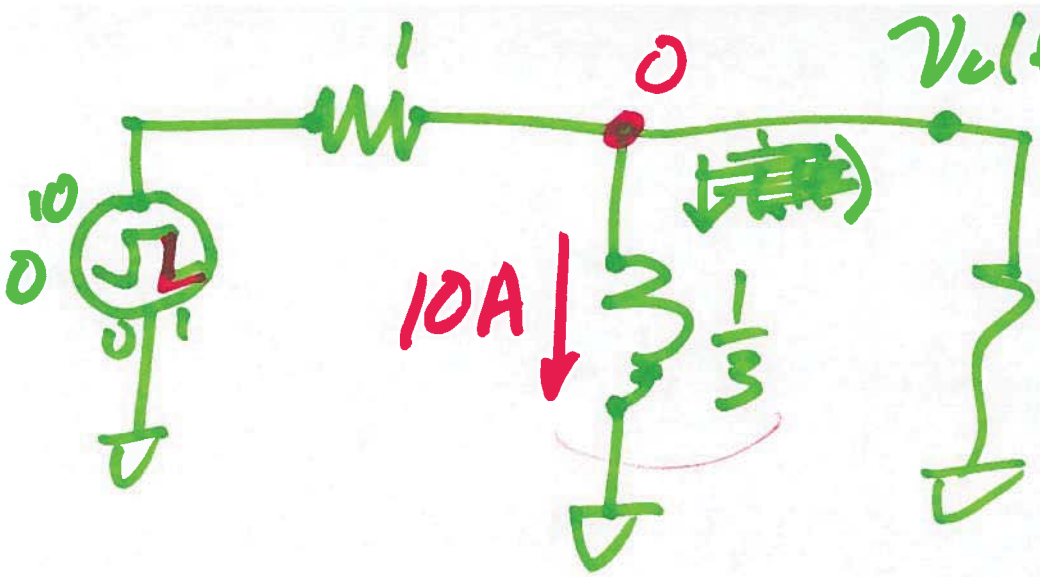


$$\frac{10 \cdot 2}{1+2} = \frac{20}{3}$$

$$R_{TH} = \frac{2 \cdot 1}{2+1} = \frac{2}{3}$$



3)



$$i(t) = \frac{v_L(t)}{2}$$

$$\tau = \frac{L}{R} = \frac{\frac{1}{2}}{\frac{2}{3}}$$

$$\boxed{\tau = \frac{1}{2}s}$$

$$\frac{10}{s} \cdot \frac{2 \cdot \frac{s}{3}}{2 + \frac{s}{3}} = V_L(s)$$

$$\frac{\frac{2 \cdot \frac{s}{3}}{2 + \frac{s}{3}}}{\frac{2 \cdot \frac{s}{3}}{2 + \frac{s}{3}} + 1}$$

$$= \frac{10}{s} \cdot \frac{2 \cdot \frac{s}{3}}{2 \cdot \frac{s}{3} + 2 + \frac{s}{3}}$$

$$V_L(s) = \frac{10}{s} \cdot \frac{2 \cdot \frac{s}{3}}{2 \cdot \frac{s}{3} + 2 + \frac{s}{3}}$$

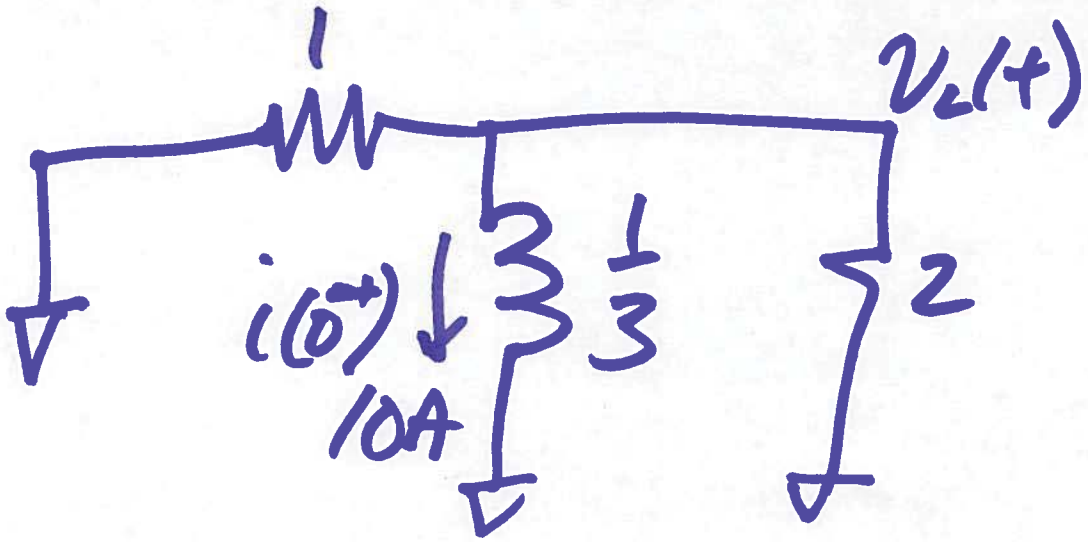
$$= 20 \cdot \frac{s/3}{\frac{3s}{3} + 2}$$

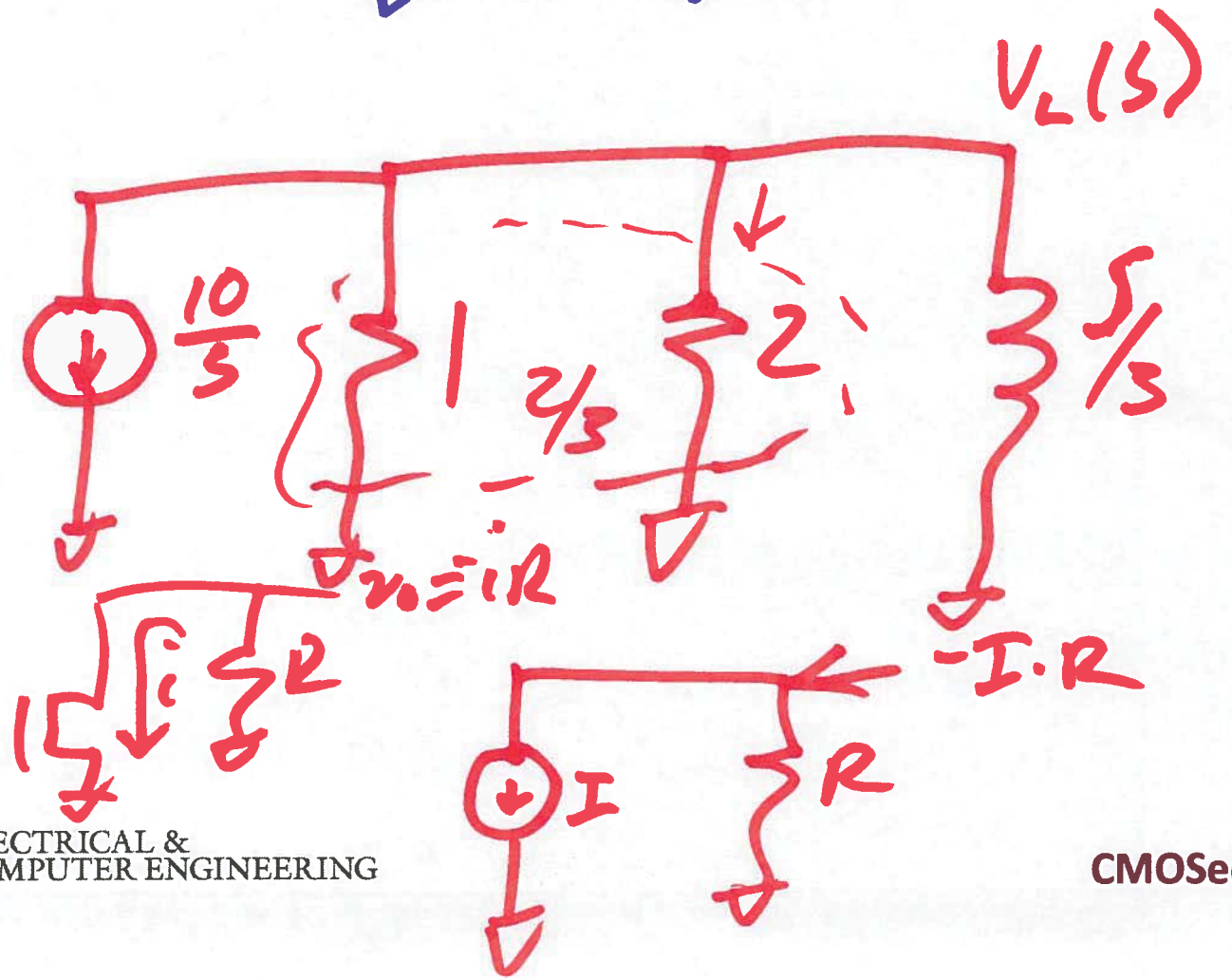
$$= \frac{20}{3} \cdot \frac{1}{s+2}$$

$$v_L(t) = \frac{20}{3} e^{-2t} u(t) \qquad 0 \le t \le 1$$

$$i(t) = \frac{20}{6} e^{-2t} u(t)$$

5)





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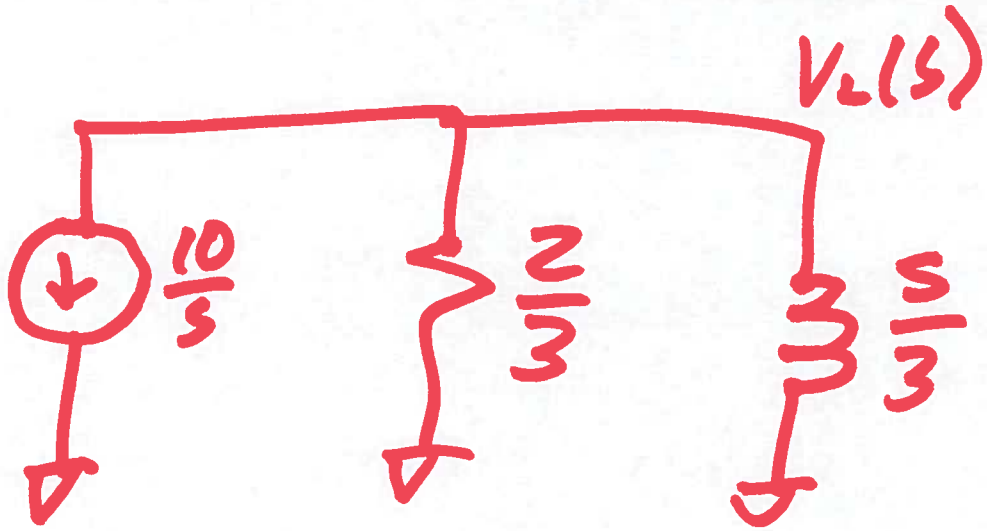
6)



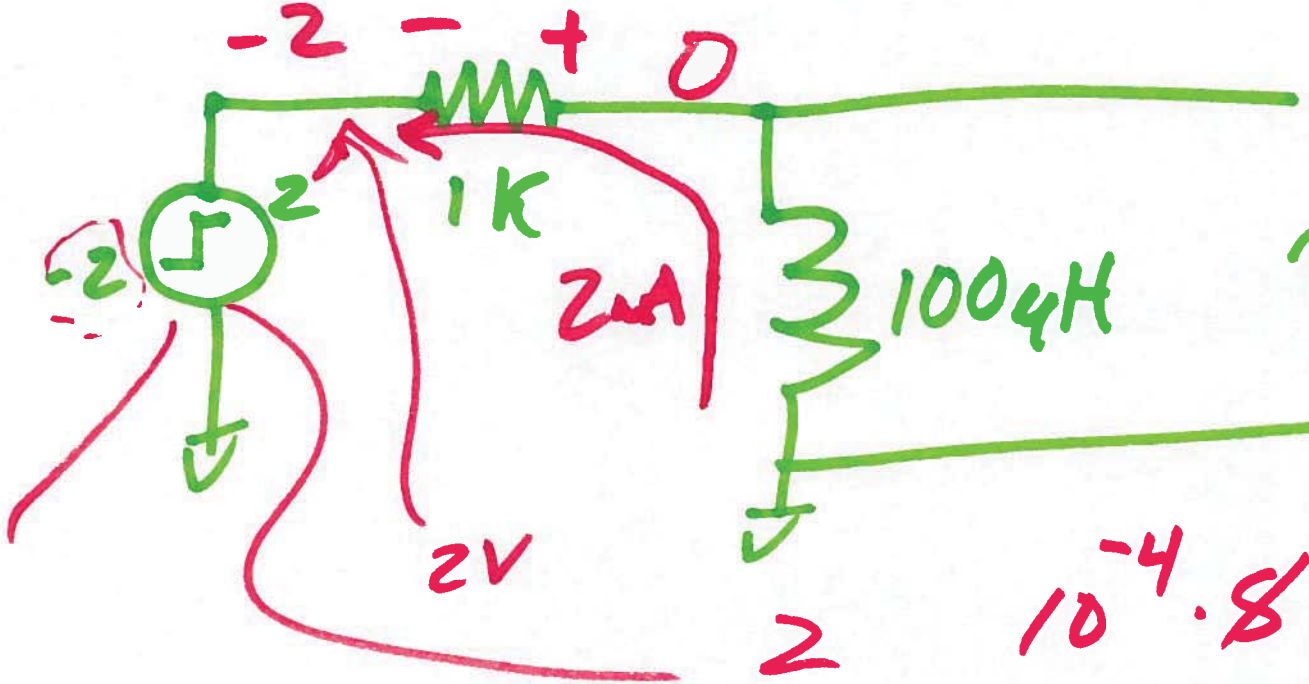
$$V_L(s) = \frac{-10}{s} \cdot \frac{\frac{2}{3} \cdot \frac{s}{3}}{\frac{2}{3} + \frac{s}{3}}$$

$$V_L(s) = \frac{-20}{3} \cdot \frac{1}{s+2} \rightarrow -\frac{20}{3} e^{-2t}$$

$$-\frac{20}{3} e^{-2(t-1)} u(t-1) \qquad t \geq 1$$

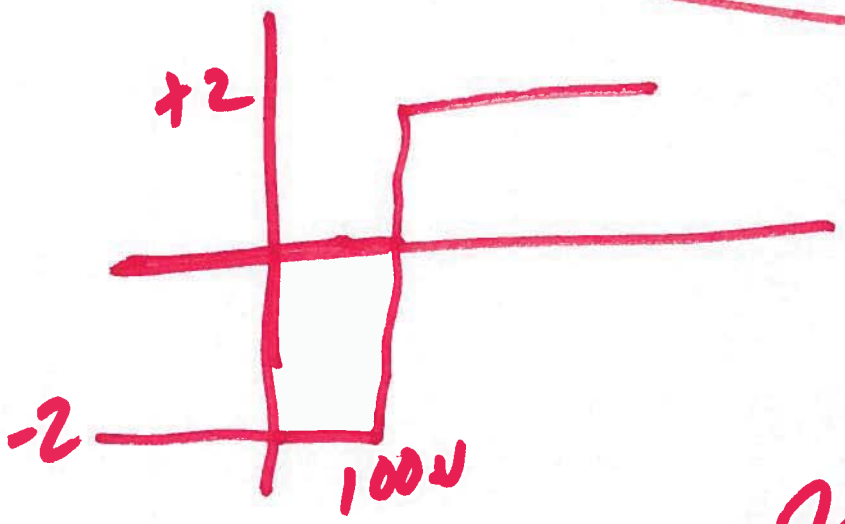
7)

$(0-(-2))/1k = 2mA$



$t < 100ns$

$v_L(t) = 0$



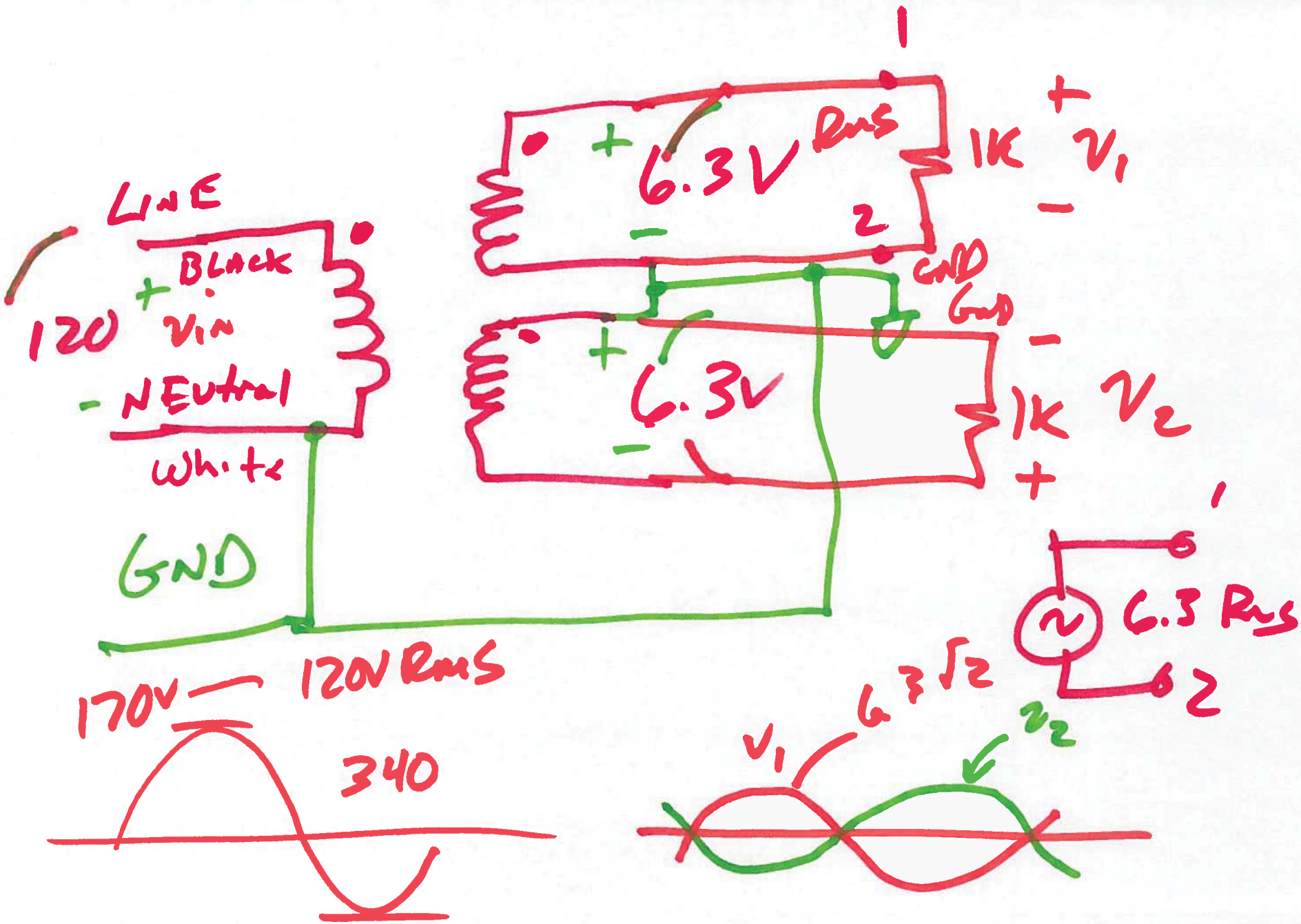
$$\frac{2}{s} \cdot \frac{10^{-4} \cdot s}{10^{-4} \cdot s + 10^{3}}$$

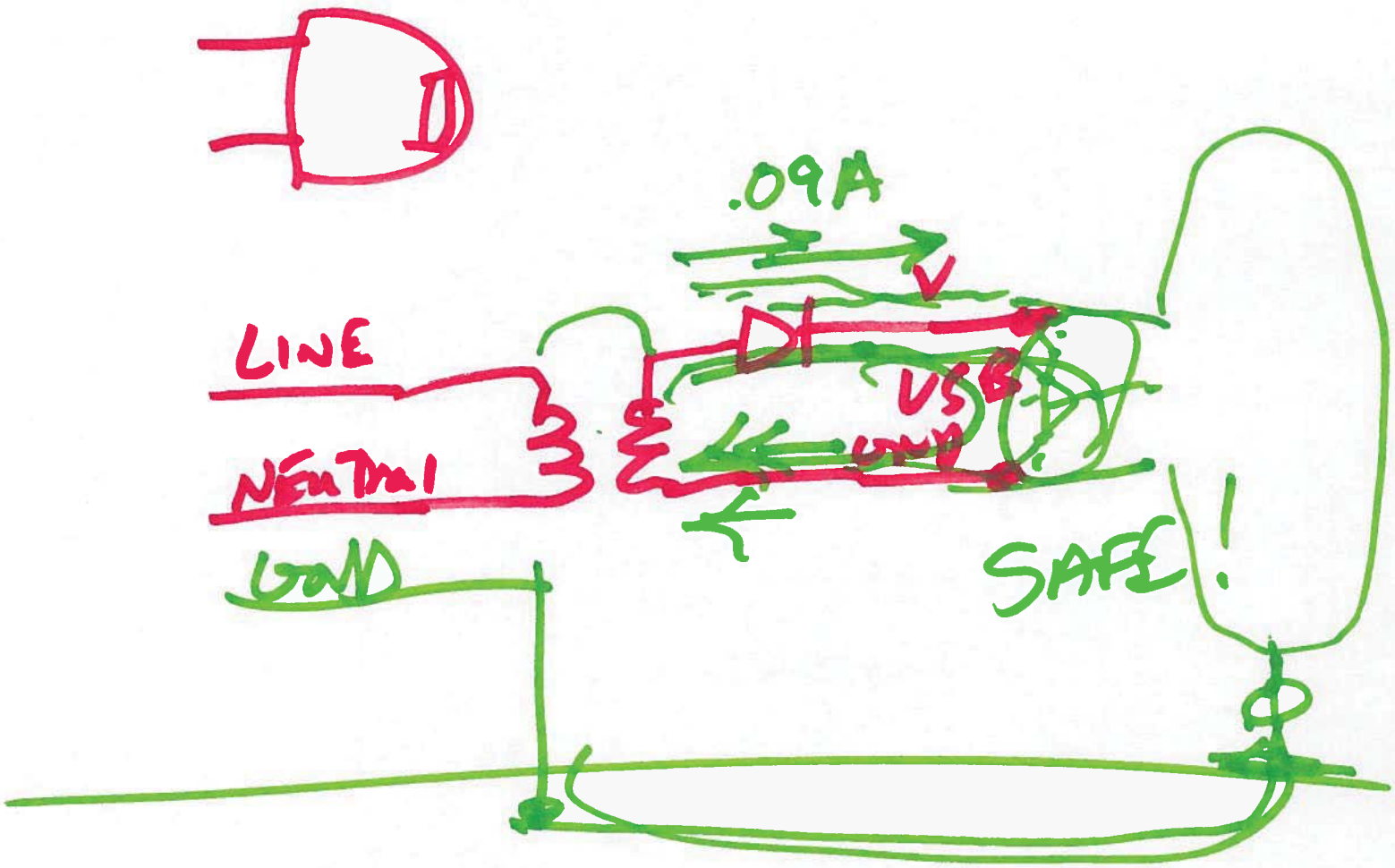
$$= 2 \cdot \frac{1}{s + 10^{7}} = \frac{2}{s + \frac{1}{10^{-7}}}$$

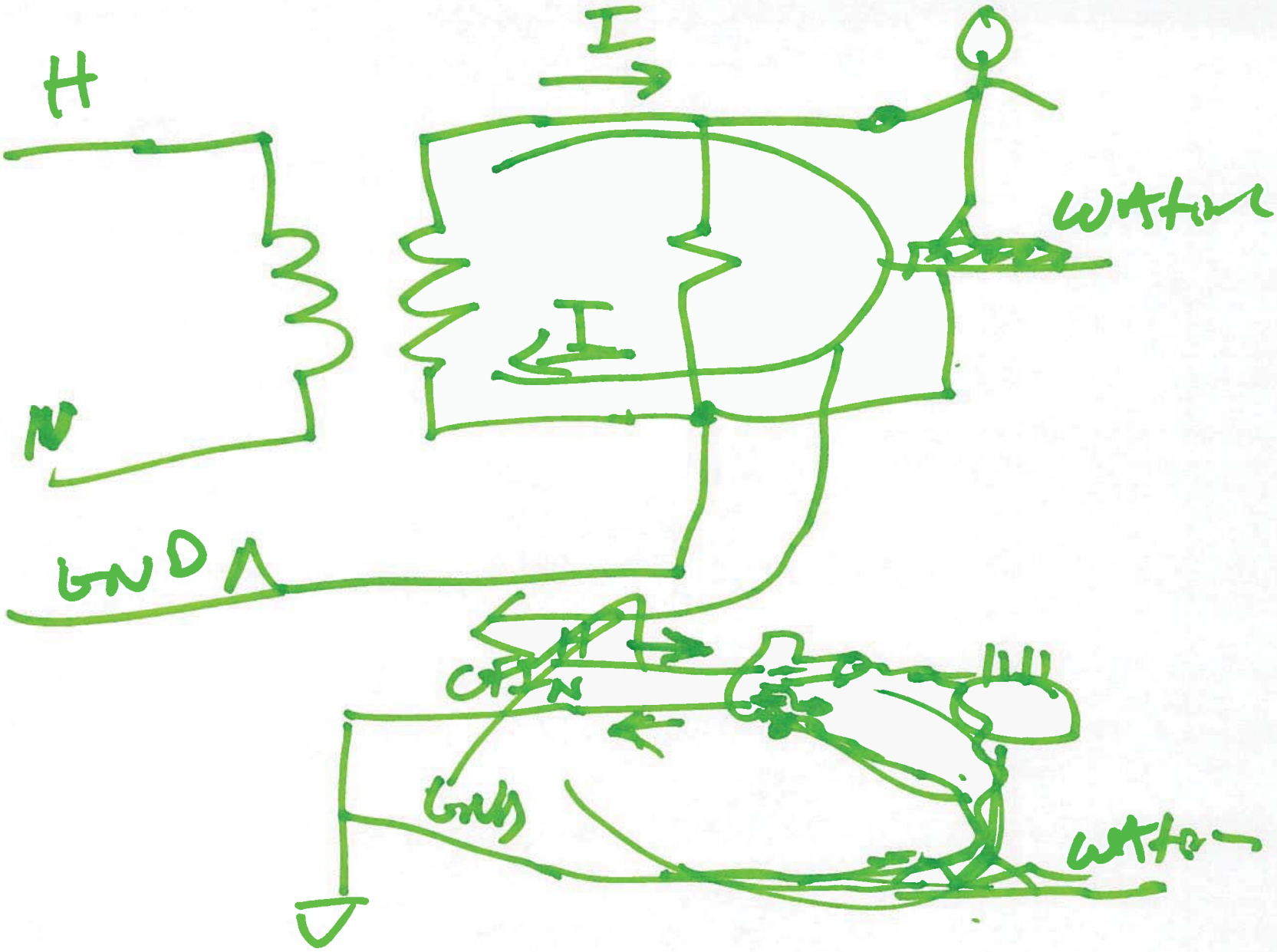
$$v_L(t) = 2 \cdot e^{-t/10^{-7}} u(t)$$

$$= 2 \cdot e^{-\frac{(t-100ns)}{10^{-7}}} u(t-100ns)$$

8)


1
6.3V Rms
1K
V_1
2
LINE
Black
120
V_{in}
Neutral
White
GND
6.3V
1K
V_2
1'
6.3 Rms
2'
170V
120V Rms
340
$6.3\sqrt{2}$
V_1
V_2


.09A
LINE
NEUTRAL
GND
USB
SAFE!


H
I
I
N
GND
OFF
N
GND
water