

# EE 221 Circuits II

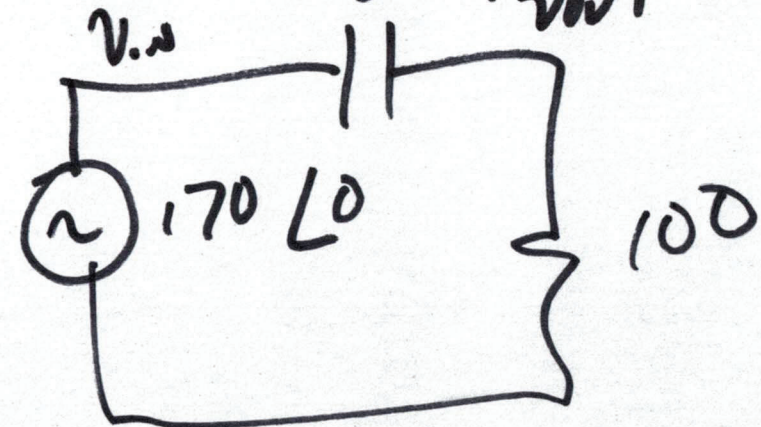
MARCH 8, 2021  $\frac{0.25}{100} = .025$

Lecture 13  $254F$

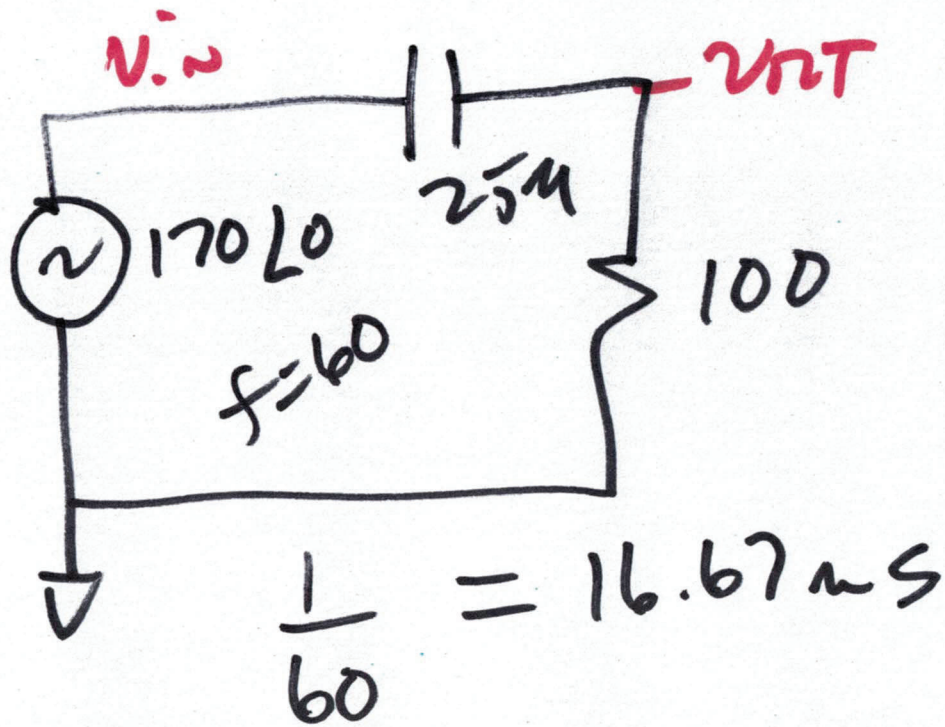
$$\tau = \frac{L}{R} = \frac{0.25}{100} = 0.0025 = 2.5 \text{ms}$$

$$RC = 2.5 \text{ms} = 100 \cdot C$$

$$C = 254F$$



11



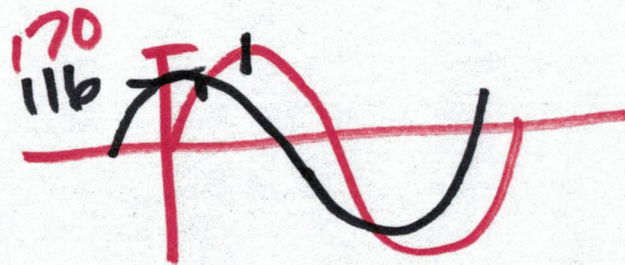
$$Z_C = \frac{1}{j \cdot 2\pi \cdot 60 \cdot 25 \mu\text{F}}$$

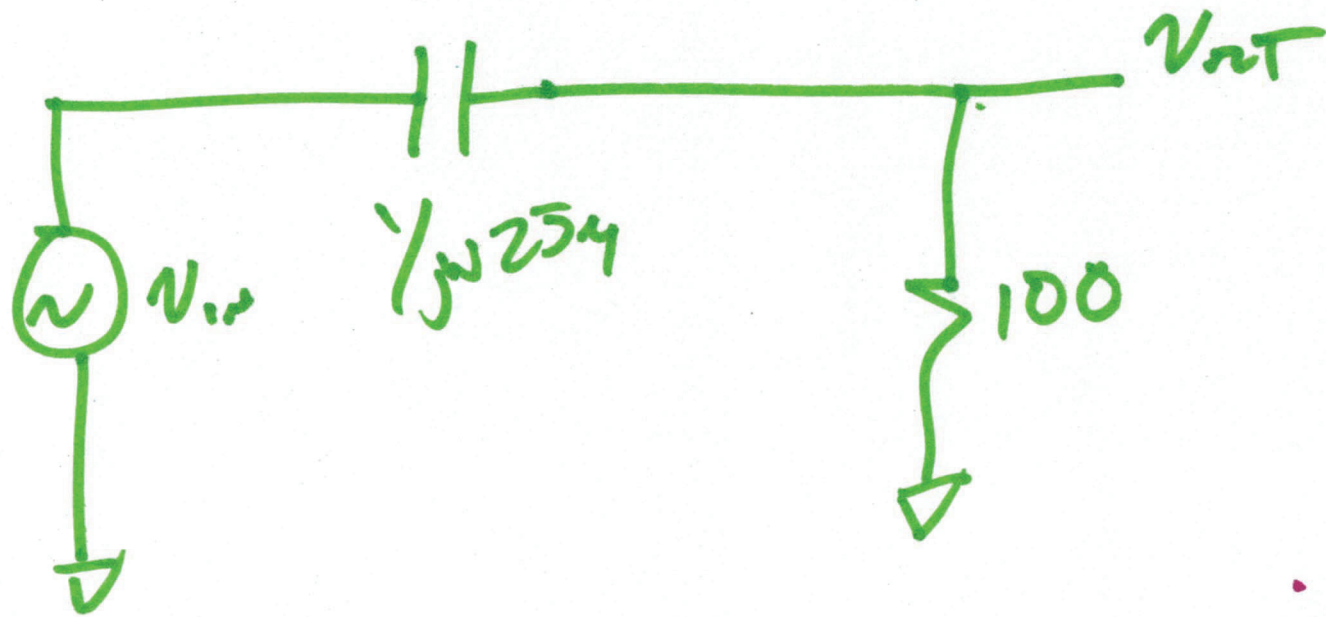
$$Z_C = -j106$$



$$v_{o(t)} = 170 \text{ V} \cdot \frac{100}{100 - j106}$$

$$\frac{\Delta t}{16.67 \text{ ms}} \cdot 360 = 46.7 = \frac{17,000 \text{ V}}{145.7 \text{ V}} = 116.7 \text{ V}$$





$$\frac{v_{out}}{v_s} = \frac{100}{\frac{1}{j\omega 254} + 100} = \frac{j \cdot 2\pi f \cdot 254 \cdot 10^2}{1 + j \cdot 2\pi f \cdot 254 \cdot 10^2}$$

$$= \frac{j \cdot \frac{f}{2\pi \cdot 254 \cdot 10^2}}{1 + j \cdot \frac{f}{2\pi \cdot 254 \cdot 10^2}}$$

$$X = \frac{1}{2\pi \cdot 254 \cdot 10^2}$$

$$X = 63.7 \text{ Hz}$$

3)

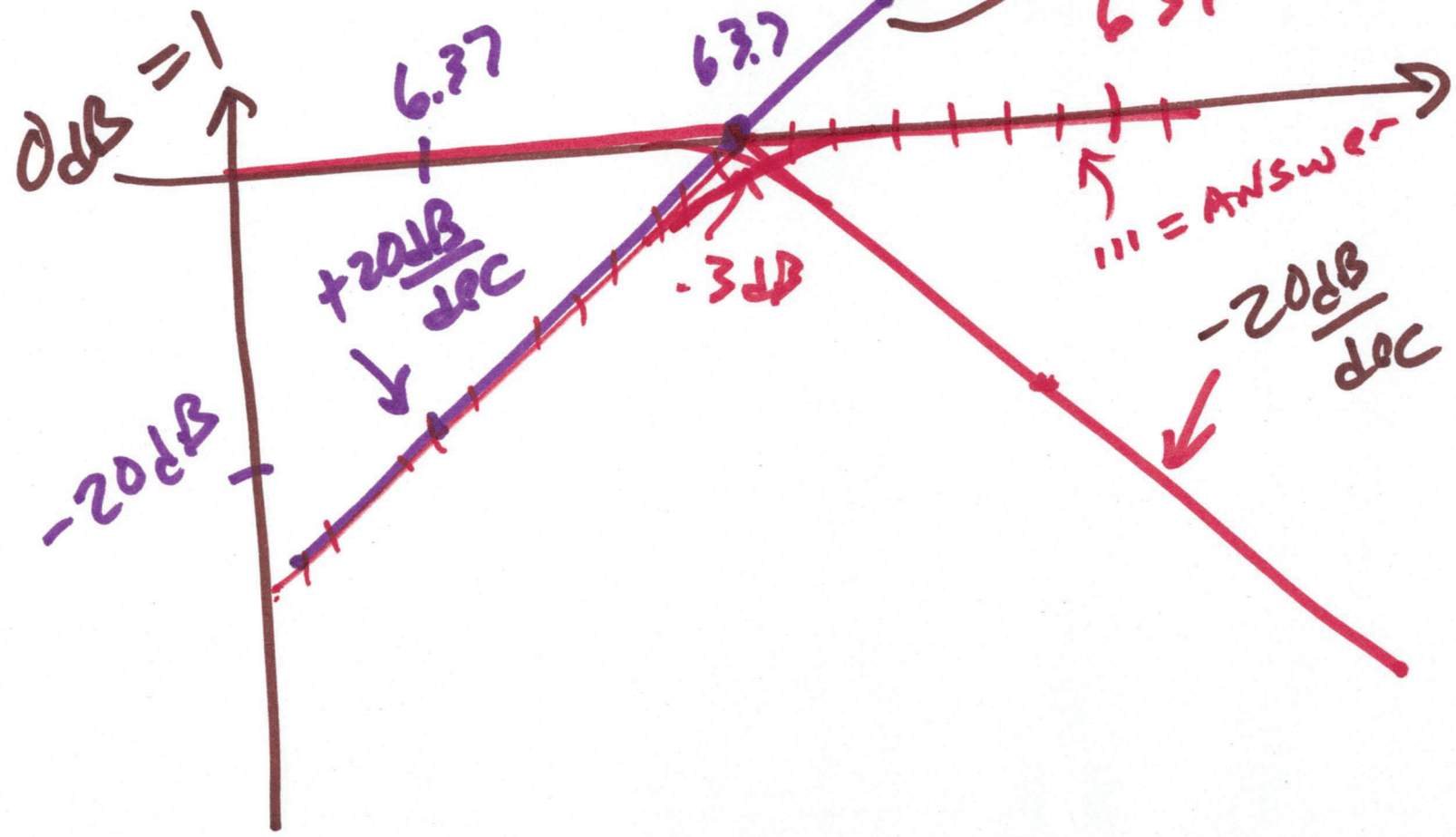
$$\frac{v_{out}}{v_{in}} = \frac{j \cdot \frac{f}{63.7}}{1 + j \cdot \frac{f}{63.7}} \quad \frac{f}{\tan^{-1} \frac{f}{63.7}}$$

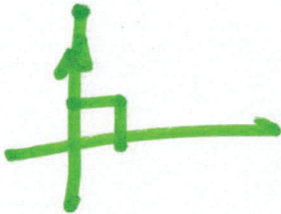
$$\left| \frac{v_{out}}{v_{in}} \right| = \frac{\frac{f}{63.7}}{\sqrt{1 + \left( \frac{f}{63.7} \right)^2}}$$

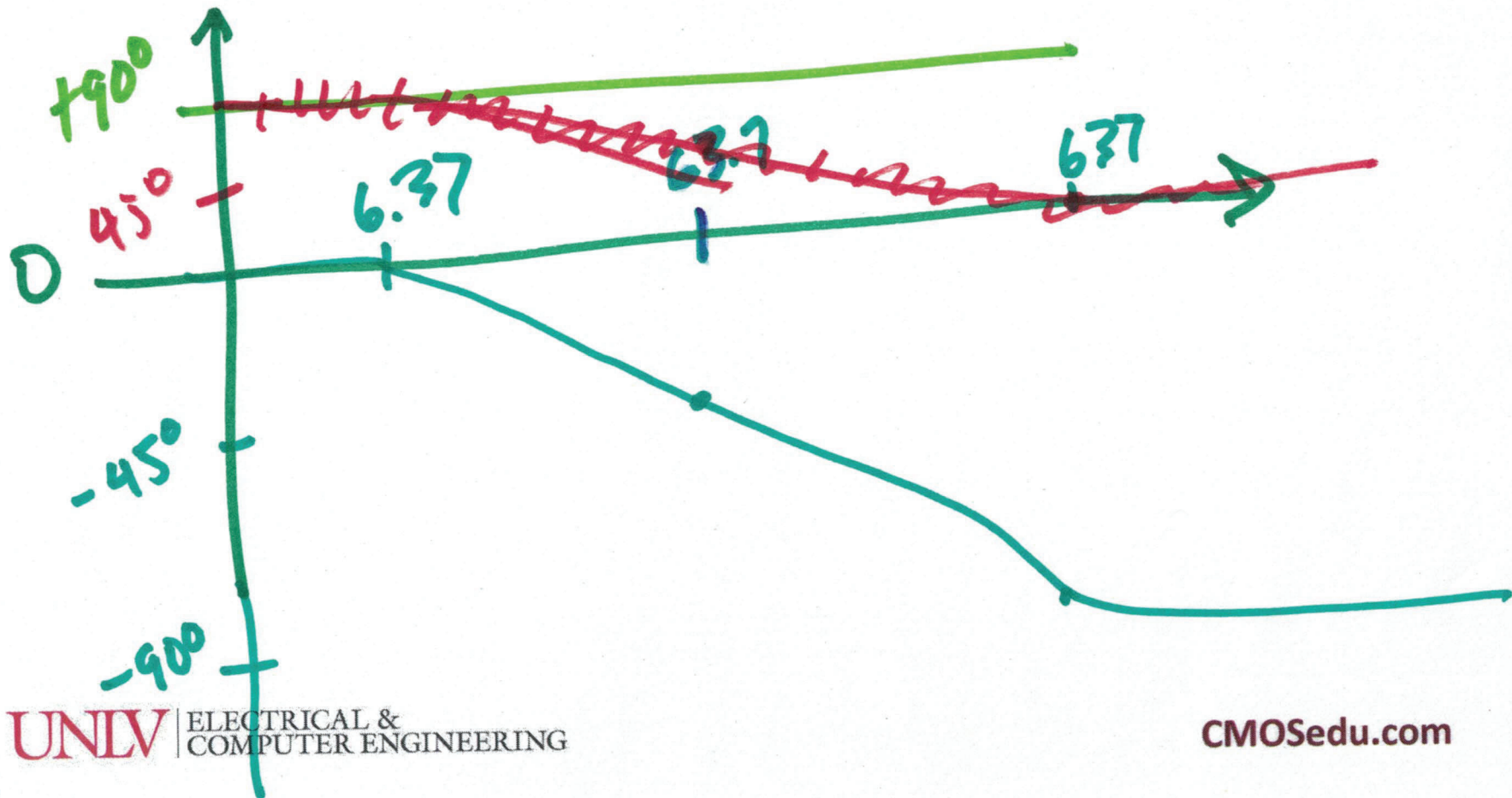
$$\angle \frac{v_{out}}{v_{in}} = 90 - \tan^{-1} \frac{f}{63.7}$$

$$\frac{V_{out}}{V_{in}} = 0 + j \frac{f}{63.7}$$

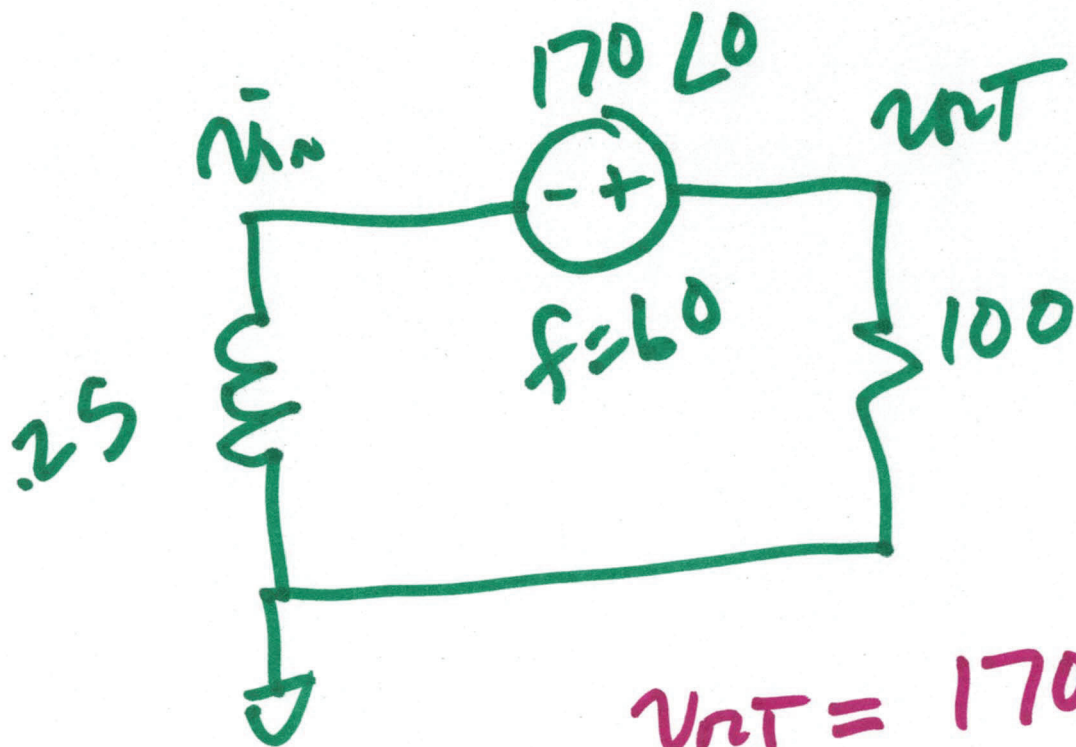
$$1 + j \frac{f}{63.7} \rightarrow +20dB/dec$$



$$\frac{V_{out}}{V_{in}} = \frac{0 + j\frac{f}{63.7}}{1 + j\frac{f}{63.7}}$$




6)



$$Z_L = j \cdot 2\pi \cdot 60 \cdot \frac{1}{4}$$

$$= j94.2$$

$$v_{RT} = 170 \angle 0$$

$$\frac{100}{100 + j94.2}$$

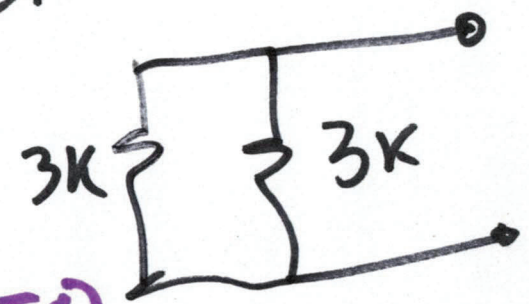
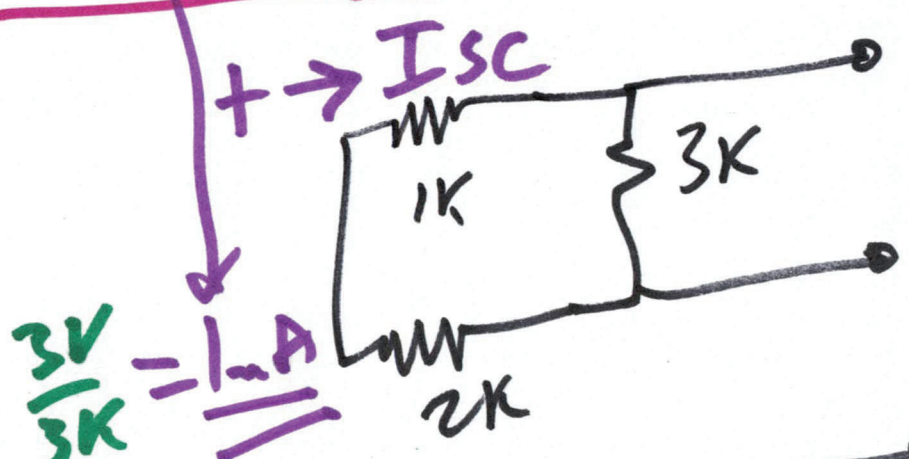
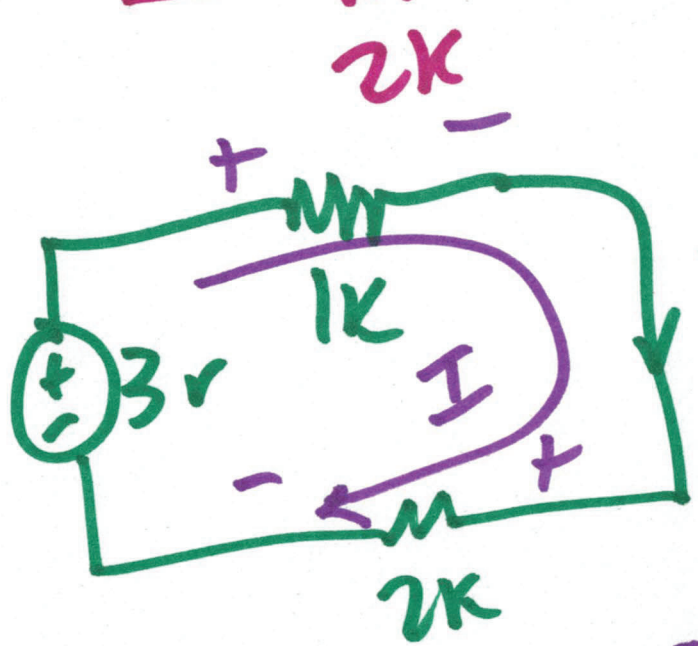
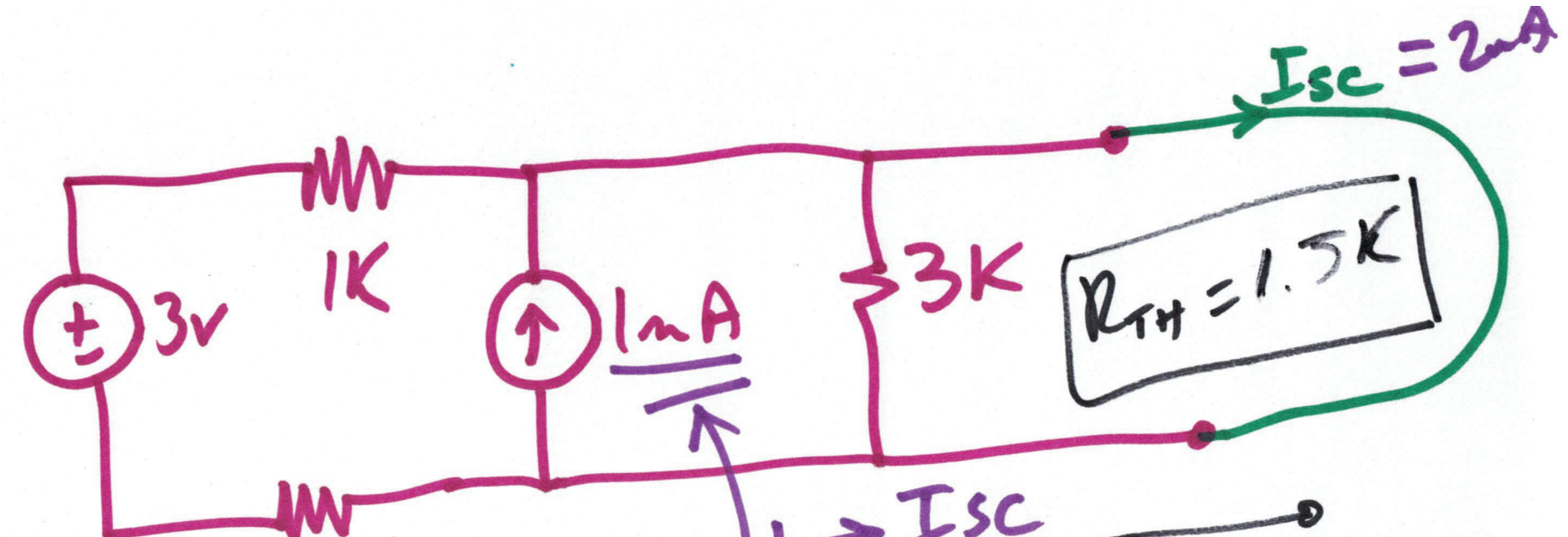
$$v_{in} = -170 \angle 0 \cdot \frac{j94.2}{100 + j94.2}$$

$$v_{RT} - v_{in} = 170 \angle 0 \left( \frac{100}{100 + j94.2} + \frac{j94.2}{100 + j94.2} \right)$$

1.

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$$3 - 1KI - 2KI = 0$$

$$I = \frac{3}{3K}$$

8)



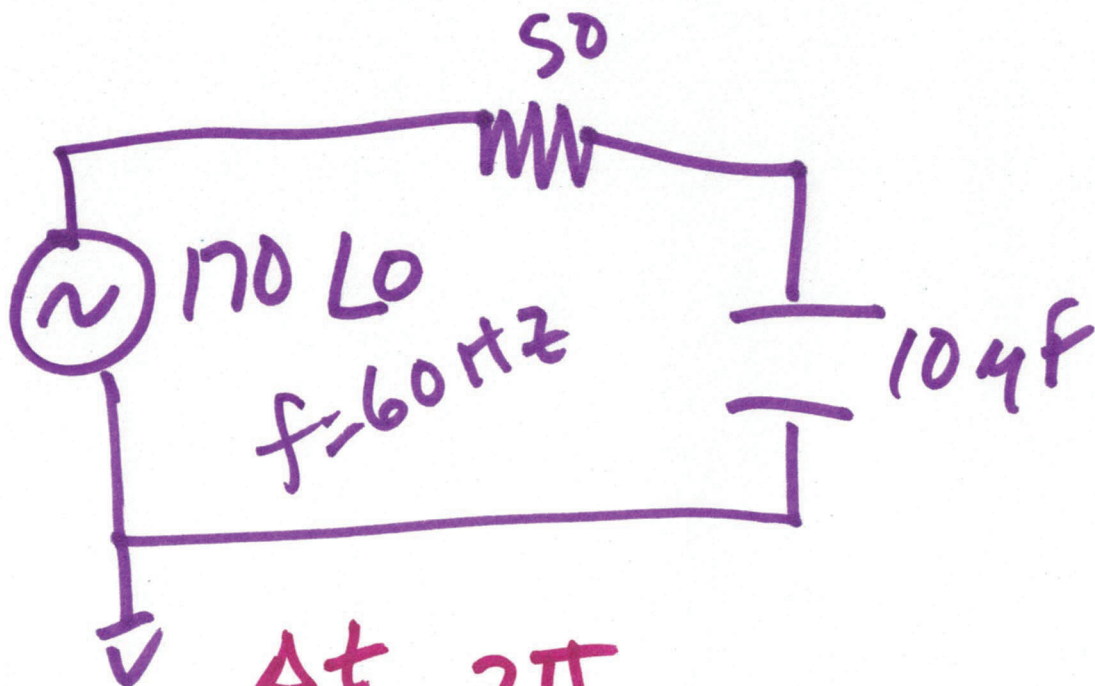
$$R_{TH} = 1.5K$$

$$I_{sc} = 2A$$

$$V_{TH} = I_{sc} \cdot R_{TH} = 3V$$

I Am right!

a)



$$v = \frac{\Delta t}{T} \cdot 2\pi$$

$$i = \frac{170 \angle 0}{50 - j265}$$

$$i(t) = .63 \sin(2\pi \cdot 60 \cdot t + 79.3)$$

$$z_c = -j \frac{1}{2\pi \cdot 60 \cdot 10^{-5}}$$

$$= -j \frac{1}{2\pi \cdot 6 \cdot 10^{-4}}$$

$$= -j265$$

$$= \frac{170 \angle 0}{269.7 \angle 79.3}$$

$$= \frac{170}{269.7} \angle 79.3$$

$$= .63 \angle 79.3$$

10)