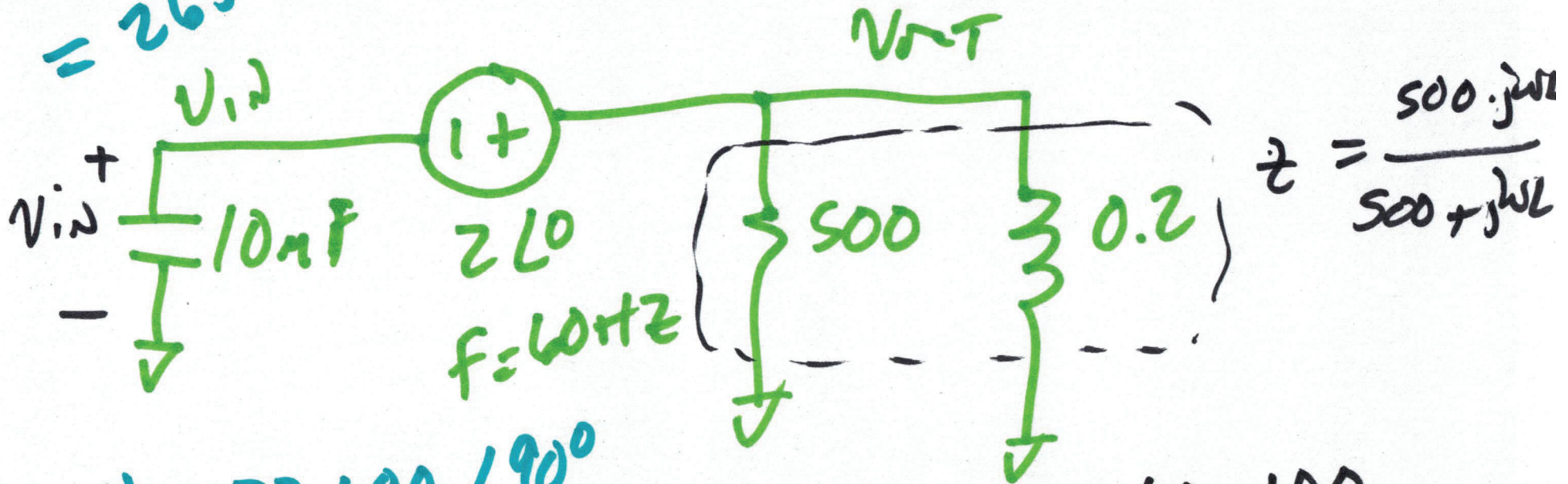


# study session

March 7, 2021

$$\frac{1}{2\pi \cdot 60 \cdot 10^{-6}} = 265 \angle -90^\circ$$

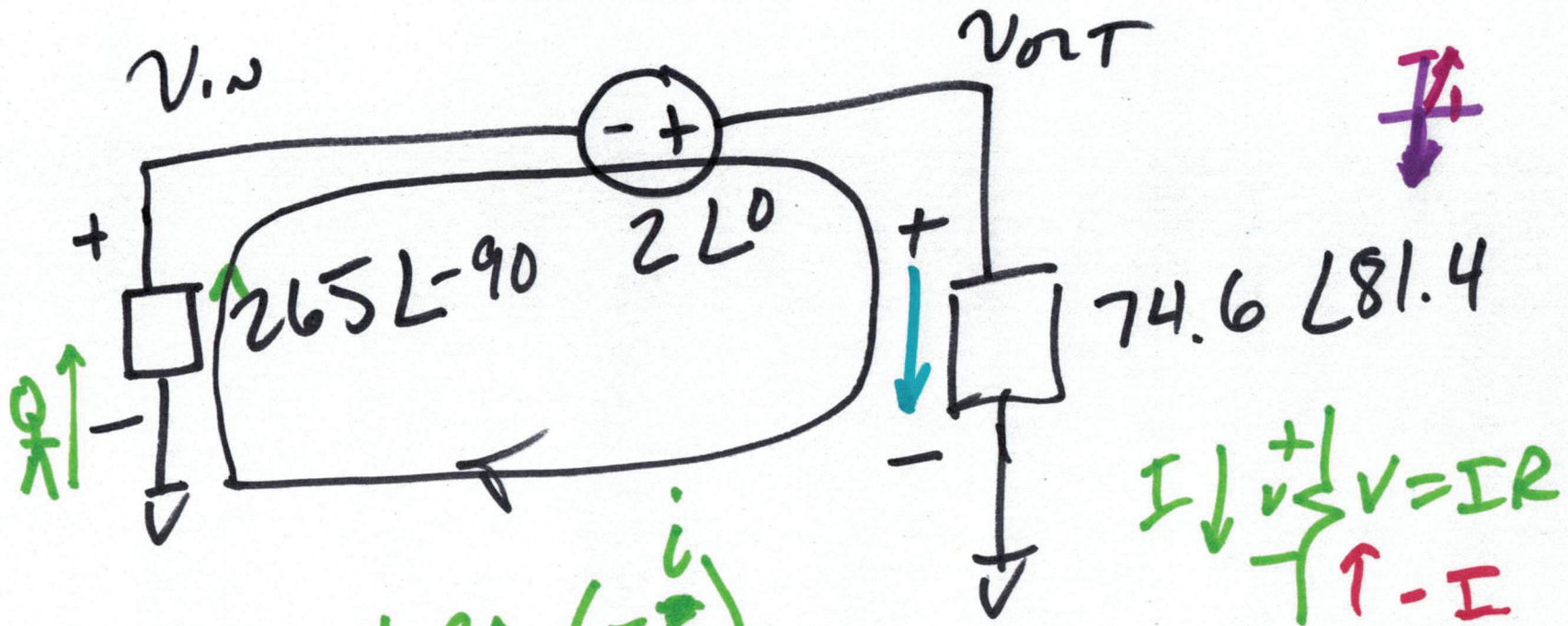


$$Z = \frac{500 \cdot j\omega L}{500 + j\omega L}$$

$$74.6 \angle 81.4^\circ = \frac{37,680 \angle 90^\circ}{505 \angle 8.5^\circ} = Z =$$

$$\frac{j \cdot 2\pi \cdot 60 \cdot 100}{500 + j \cdot 2\pi \cdot 60 \cdot 0.2}$$





$$+ 265 \angle -90 \cdot (-i)$$

$$+ 2 \Omega - 74.6 \angle 81.4 \cdot i = 0$$

$$2 \Omega = i (265 \angle -90 + 74.6 \angle 81.4)$$

$$(0 + j(-265) + 11.2 + j73.8)$$

$$i \cdot (j(-191) + 11.2)$$

3)



$$2\angle 0 = i(11.2 + j(-191))$$

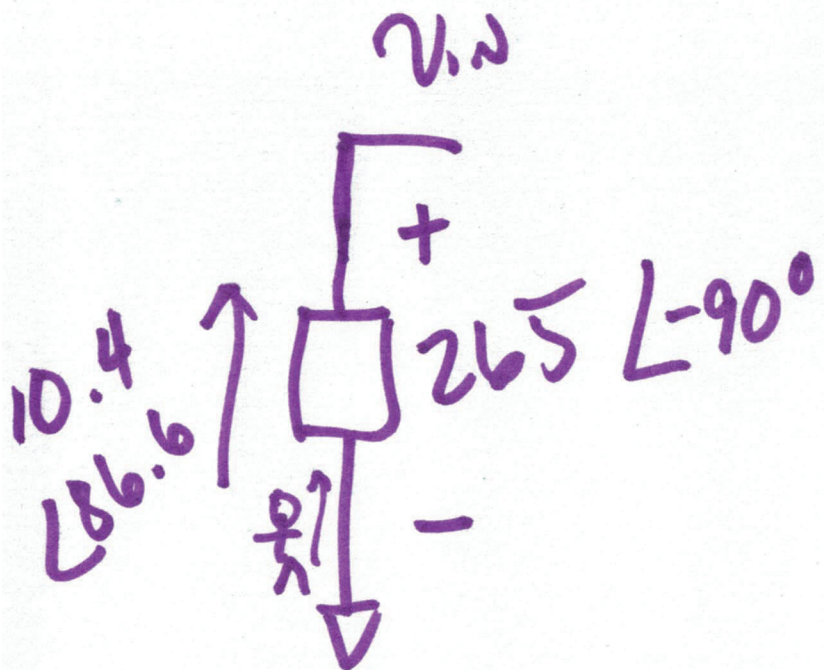
$$2\angle 0 = i \cdot 191.2 \angle -86.6$$

$$i = \frac{2\angle 0}{191.2 \angle -86.6}$$

$$= 10.4 \text{ mA} \angle 86.6$$



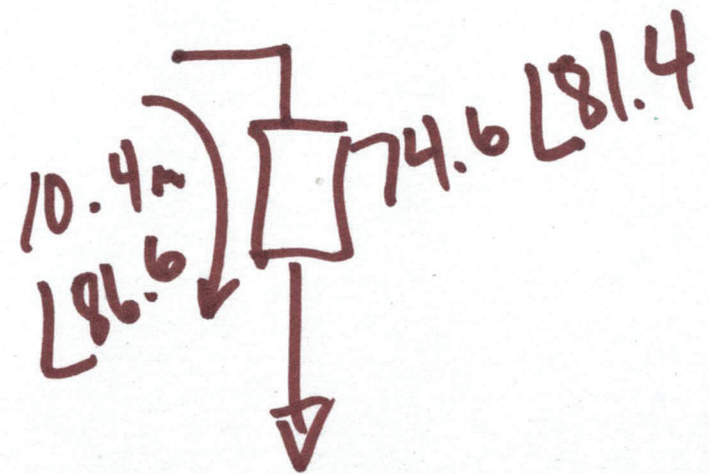




$$+ 265 \angle -90 \cdot (-1) \cdot 10.4 \mu \angle 86.6$$

$$v_{in} = \cancel{265} \angle \cancel{-90} \cdot \cancel{10.4} \angle \cancel{86.6}$$

$$2.756 \angle +176.6$$



$$v_{out} = 10.4 \mu A \cdot 74.6$$

$$\angle 86.6 + 81.4$$

$$v_{out} = 775 \mu V \angle 168$$





$$V_{in} = 2.75 \mu\text{V} \angle 176.6^\circ - 176.6^\circ = 2.75 \angle 0^\circ$$

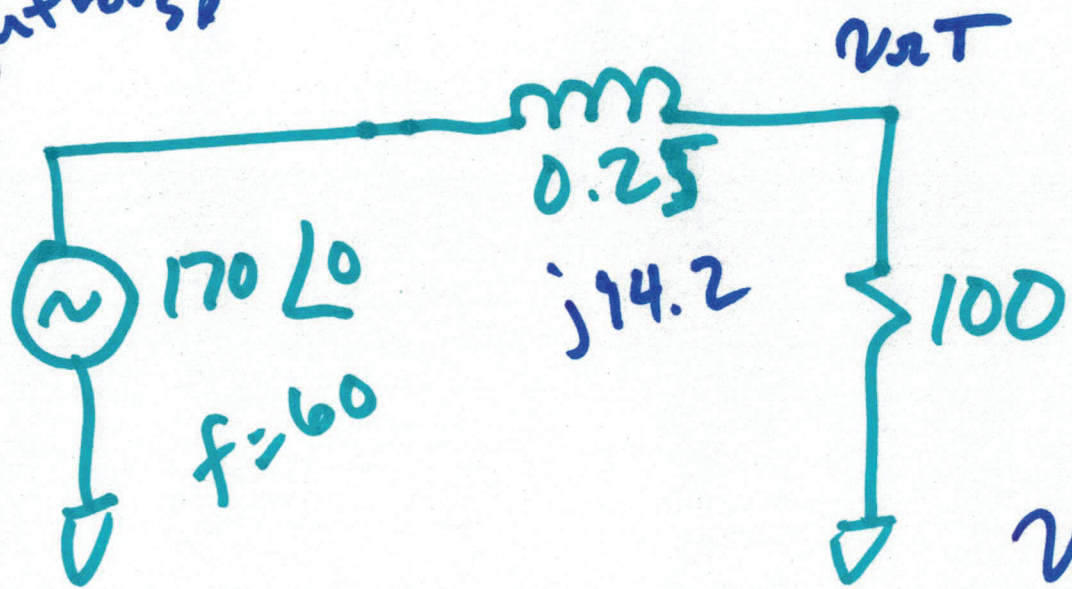
$$V_{out} = 775 \mu\text{V} \angle 168^\circ - 176.6^\circ = 775 \mu\text{V} \angle -8.6^\circ$$

$$-8.6 = \frac{\Delta t}{16.67 \mu\text{s}} \cdot 360$$

$$\Delta t = 0.4 \mu\text{s}$$



light bulb



$$j \cdot 2\pi \cdot 60 \cdot 0.25 = j94.2$$

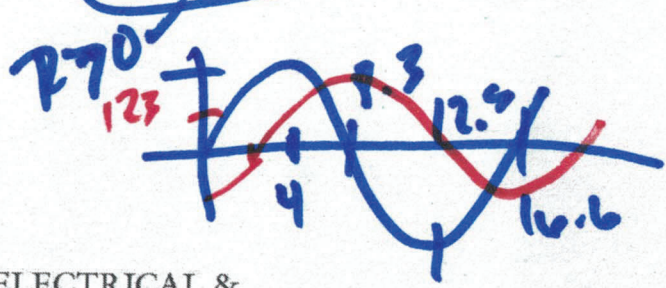
$$V_{RT} = 170 \angle 0^\circ \cdot \frac{100}{100 + j94.2}$$

$$\frac{360}{16.6} \cdot \Delta t = -43.3$$

$$\Delta t = 2 \mu s$$

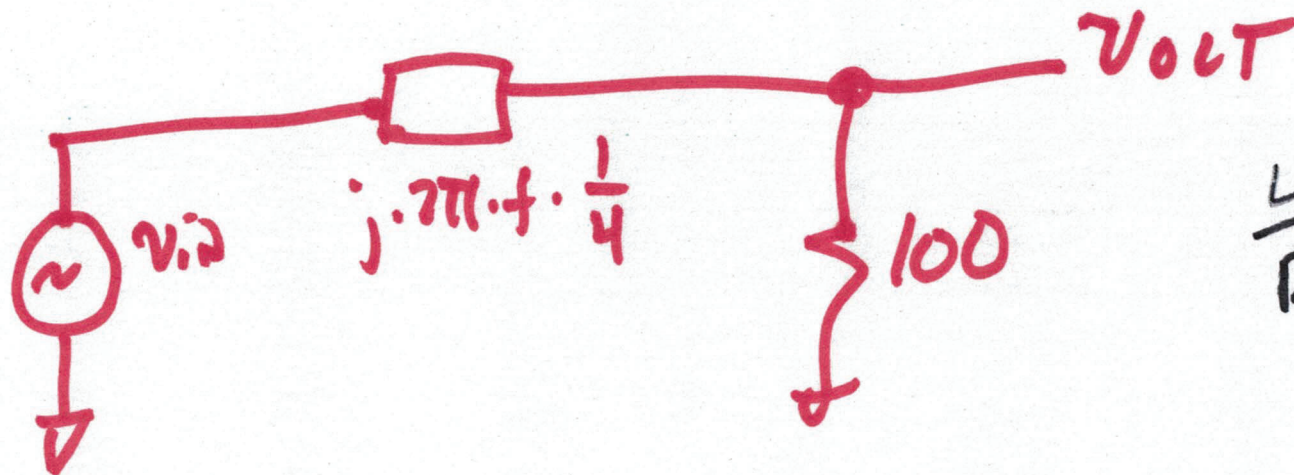
$$= \frac{17000 \angle 0^\circ}{137.4 \angle 43.3^\circ}$$

$$V_{RT} = 123.7 \angle -43.3^\circ$$



6





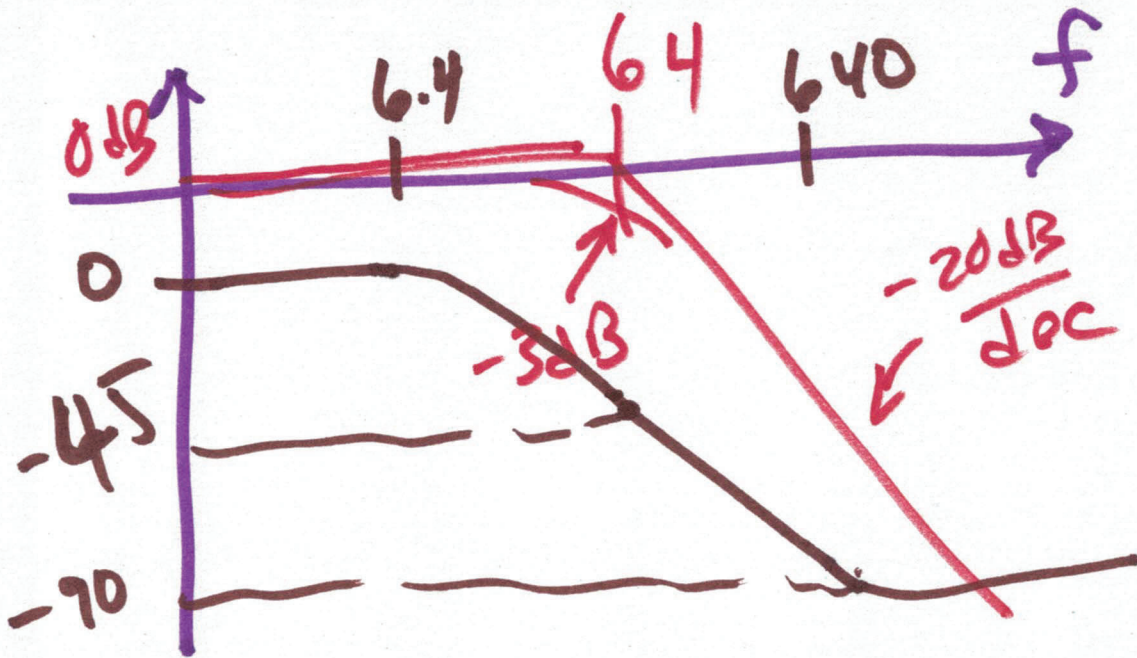
$$\frac{L}{R} = \frac{.25}{100} = 25\mu$$

$$\frac{V_{out}}{v_{in}} = \frac{100}{100 + j \cdot 2\pi f \cdot \frac{1}{4} \cdot 100} = \frac{1}{1 + j \cdot \frac{2\pi \cdot f \cdot 25}{400}}$$

$$\frac{V_{out}}{v_{in}} = \frac{1}{1 + j \frac{f}{\frac{400}{2\pi \cdot 25}}} = \frac{1}{1 + j \frac{f}{64\text{Hz}}}$$



$$\frac{v_{out}}{v_{in}} = \frac{1}{1 + j \frac{f}{64 \text{ Hz}}}$$



$$\left| \frac{v_{out}}{v_{in}} \right| = \frac{1}{\sqrt{1 + \left( \frac{f}{64} \right)^2}}$$

$$\angle -\tan^{-1} \frac{f}{64 \text{ Hz}}$$

prob. 6

$$v_{out} = 173.7 \angle -43.3$$

$$\left| \frac{v_{out}}{v_{in}} \right| = \frac{1}{\sqrt{1 + \left( \frac{60}{64} \right)^2}}$$

$$\angle -\tan^{-1} \frac{60}{64} = -43.2^\circ$$

$$\left| \frac{v_{out}}{v_{in}} \right| = .73$$

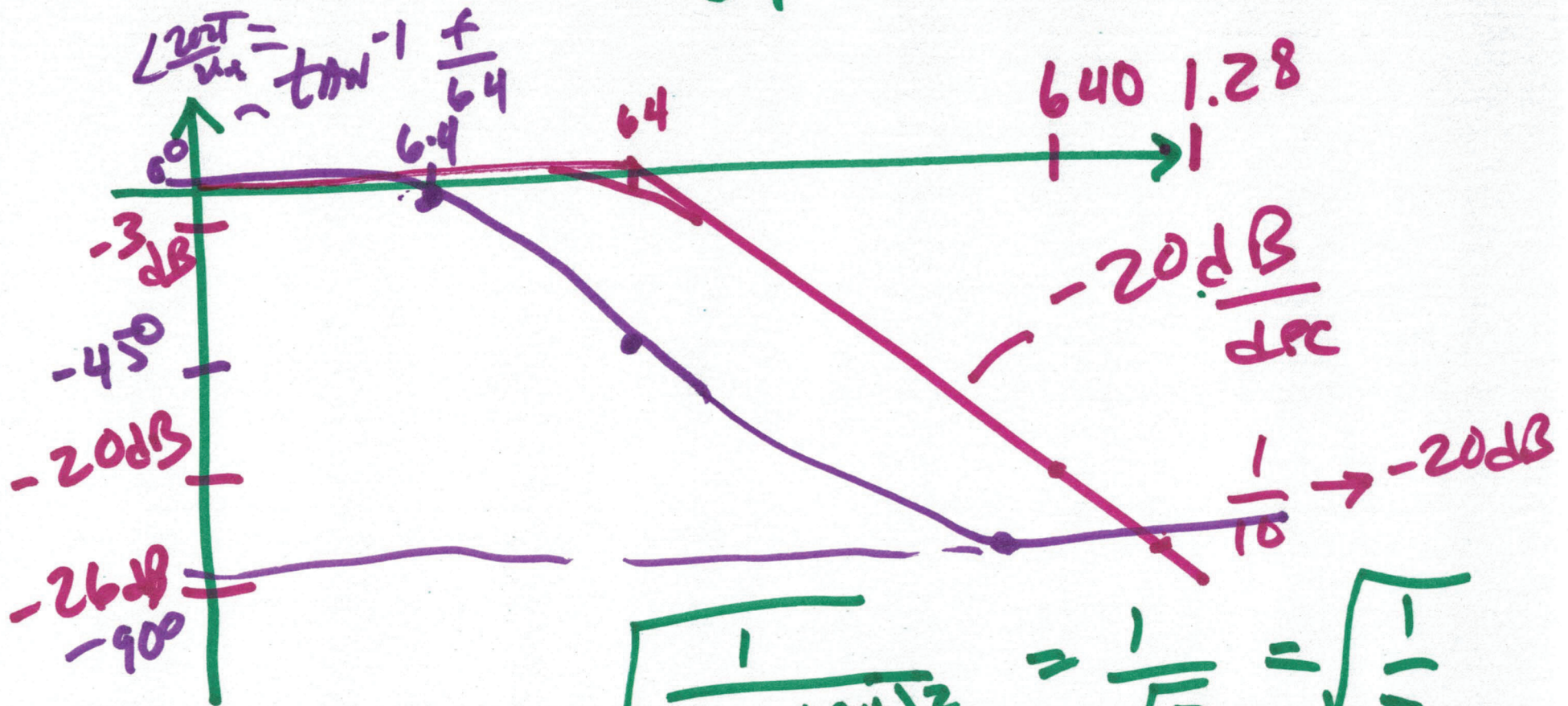
$$v_{in} = 170$$

$$v_{out} = 170 \cdot .73 = 124$$



$$\frac{v_{out}}{v_{in}} = \frac{1}{1 + j \frac{f}{64}}$$

$$-3\text{dB} \rightarrow \frac{1}{\sqrt{2}} f = 64$$

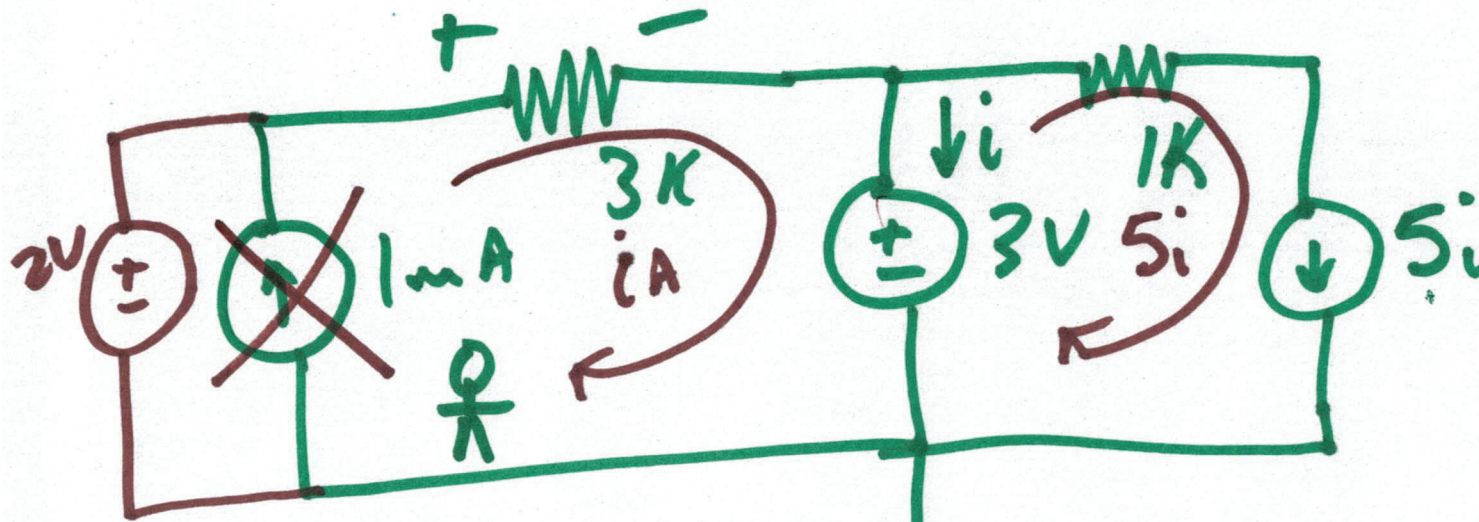


$$\sqrt{\frac{1}{1 + \left(\frac{64}{64}\right)^2}} = \frac{1}{\sqrt{2}} = \sqrt{\frac{1}{2}}$$

$$\sqrt{\frac{1}{1 + \left(\frac{f}{64}\right)^2}} \rightarrow f \gg 64 \frac{64}{f} \rightarrow \frac{64}{640} = \frac{1}{10} \rightarrow 32 \cdot 10^{-3}$$

a)





~~$1mA = i + 5i \rightarrow i = \frac{1}{6} mA$~~

$i = \cancel{1}A - 5i \rightarrow 6i = -\frac{1}{3} mA$

$2V - 3k \cdot iA - 3 = 0$

$i = -\frac{1}{18} mA$

$iA = -\frac{1}{3k} A$

$iA = -\frac{1}{3} mA$