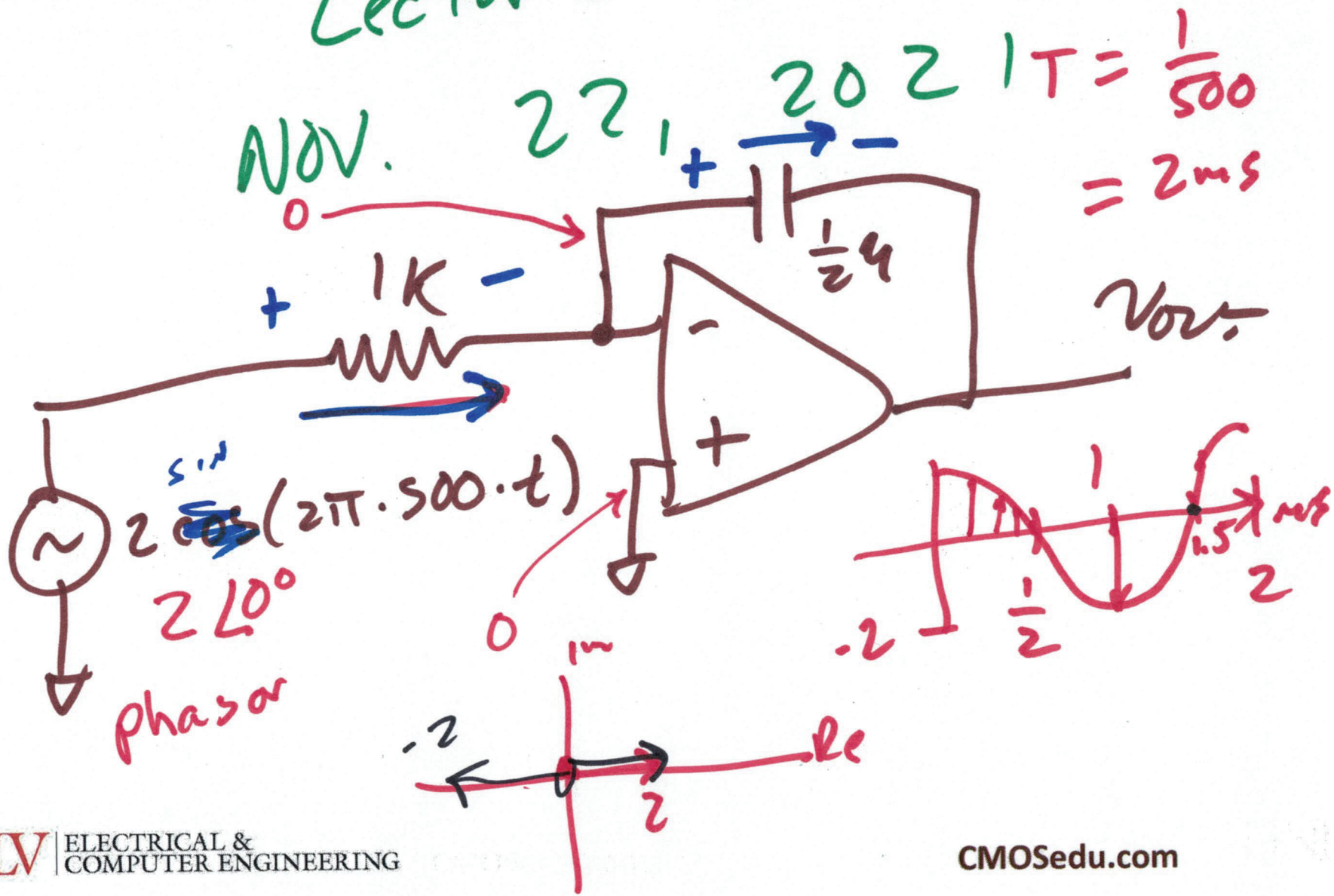
EE 220 circuits 1

Lecture 24

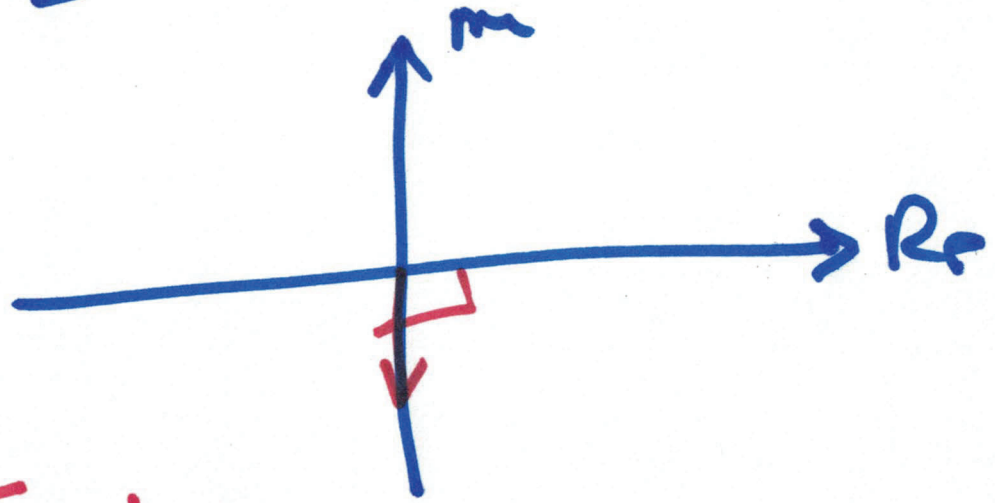
NOV. 22, 2021



$$\frac{20 - 0}{1K} = \frac{0 - 20\angle T}{\frac{1}{j \cdot 2\pi \cdot \frac{1}{2} \cdot 4f}}$$

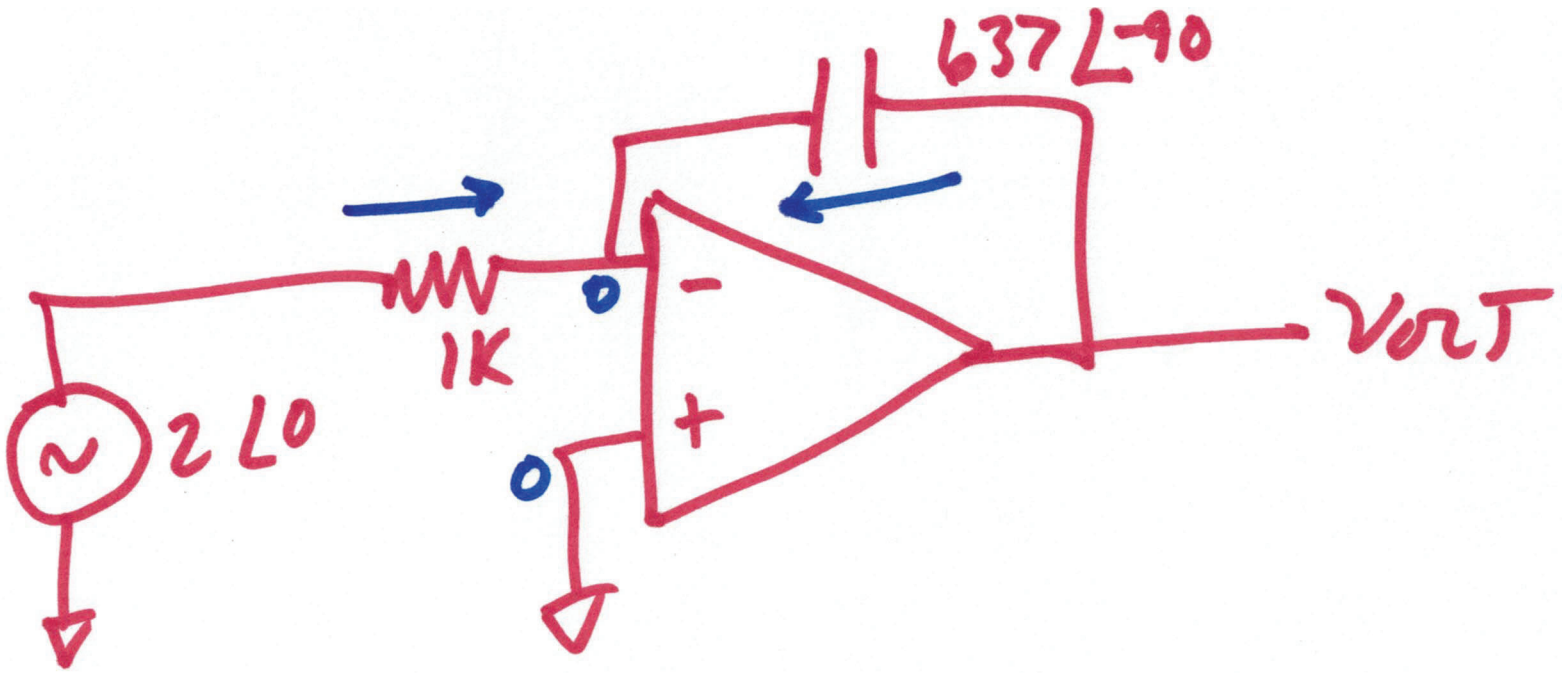
$$2mA\angle 0$$

$$\frac{1}{jwC} = -j \cdot \frac{1}{\omega C} = 637\angle -90$$



$$\frac{1}{2\pi \cdot 500 \cdot \frac{1}{2} \cdot 4}$$

$$= 637$$



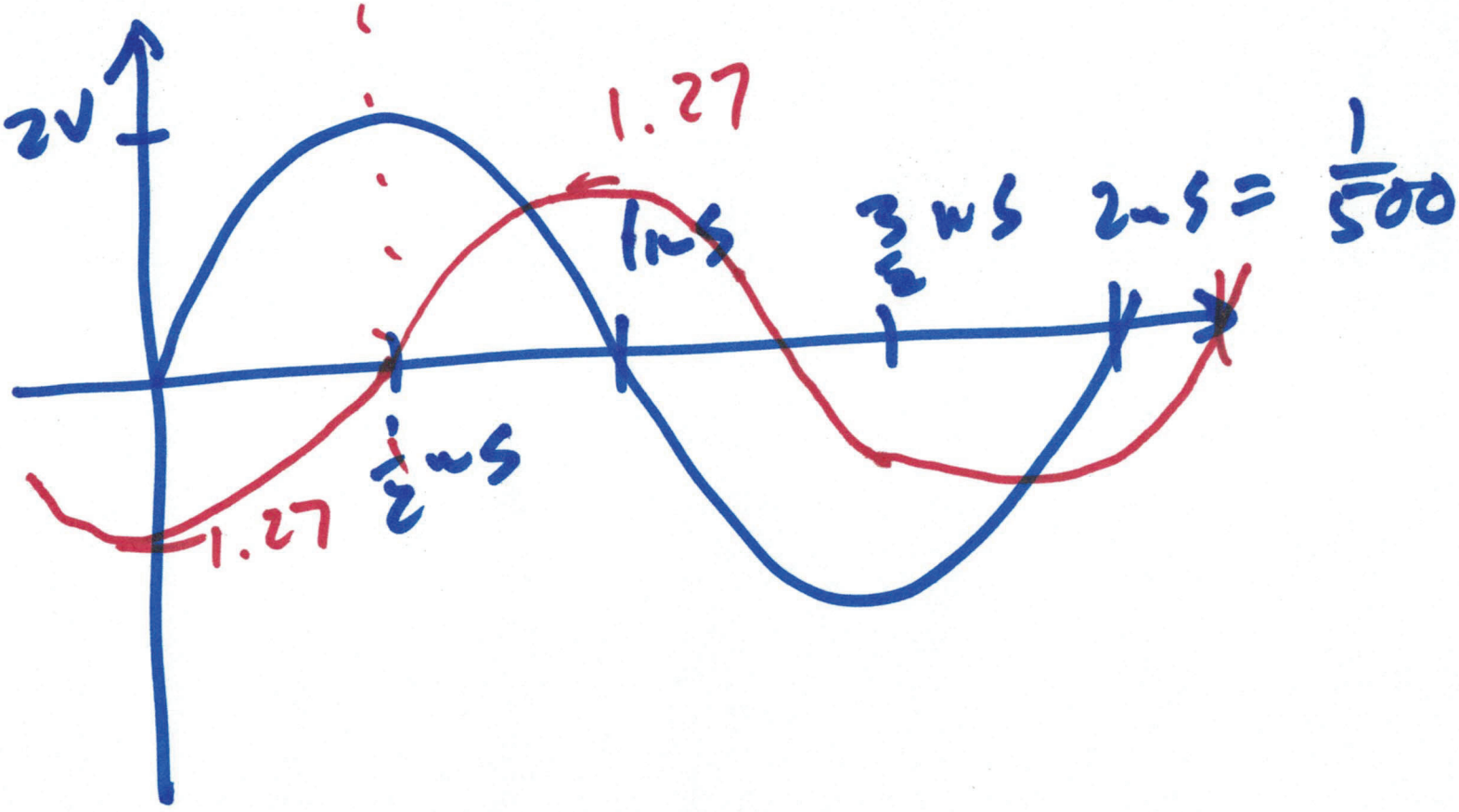
$$\frac{2\angle 0 - 0}{1K} + \frac{V_{OUT} - 0}{637\angle -90} = 0$$

$$2\angle 0 \cdot 637\angle -90 = V_{OUT}$$

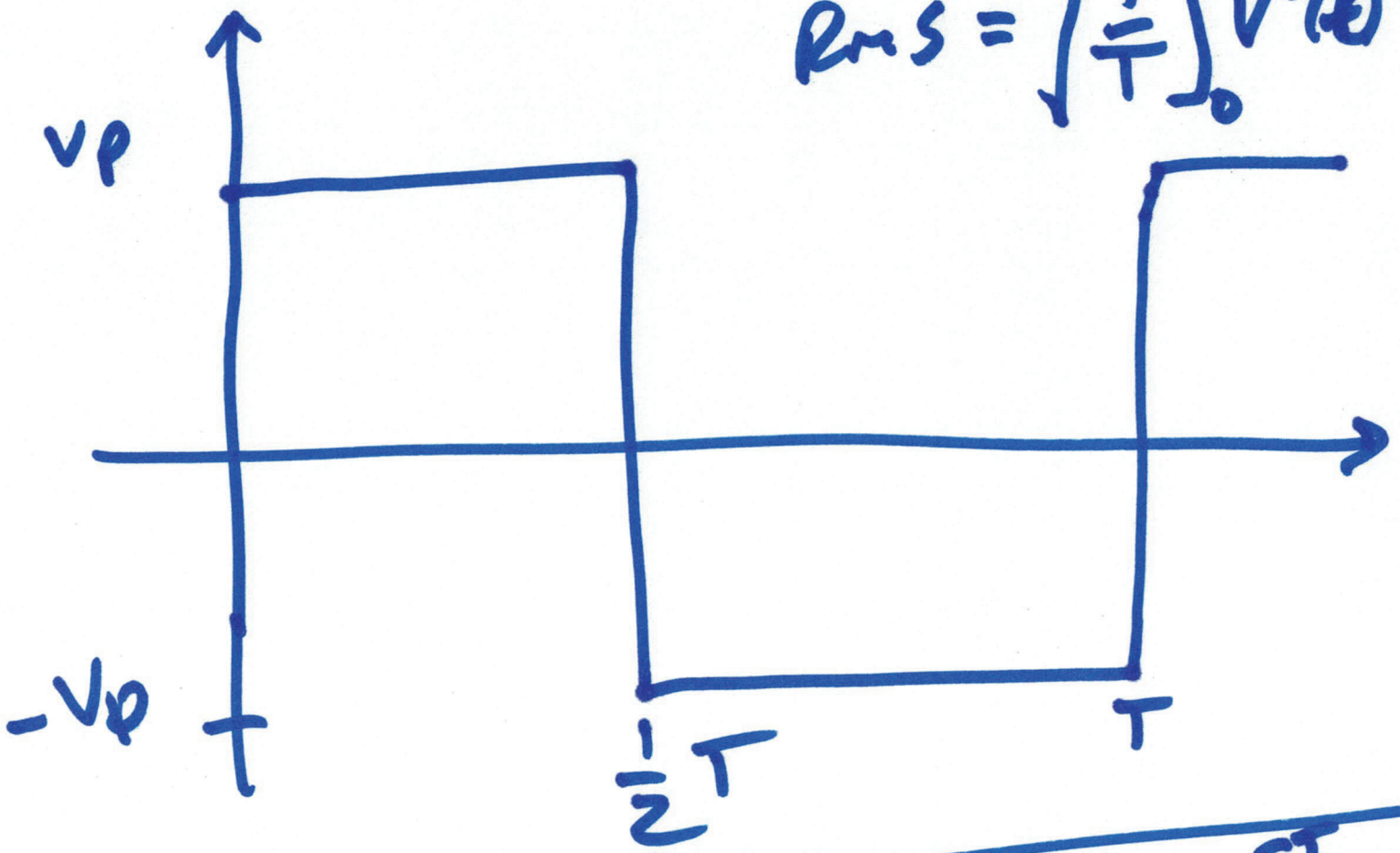
$$V_{OUT} = 1.27\angle -90$$

$v_{in} = 2\angle 0 = 2\sin(2\pi \cdot 500 \cdot t)$ (cos)

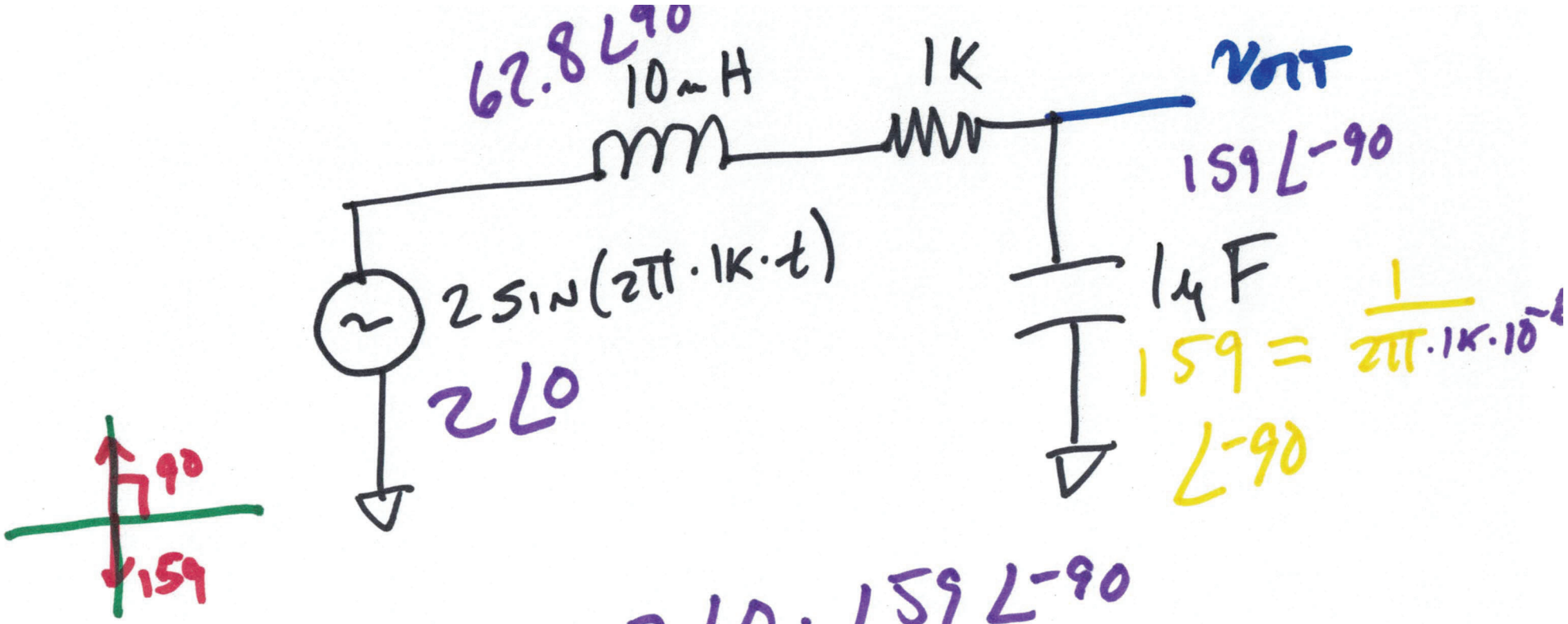
$v_{OUT} = 1.27\angle -90 = 1.27\sin(2\pi \cdot 500\, t$ (cos -90)



$$Rms = \sqrt{\frac{1}{T}\int_0^T v^2(t)\cdot dt}$$



$$Rms = \sqrt{\frac{1}{T}\left[\int_0^{\frac{1}{2}T} V_p^2\cdot dt + \int_{\frac{1}{2}T}^{T} (-V_p)^2\cdot dT\right.}$$



$$V_{OUT} = \frac{2\angle 0 \cdot 159\angle -90}{62.8\angle 90 + 1000 + 159\angle -90}$$

$62.8\angle 90 = 0 + 62.8j$; $159\angle -90 = -159j$

$62.8\cdot\cos 90 + j\,62.8\cdot\sin 90$

$62.8\cdot\cos 90$: Re ; $62.8\cdot\sin 90$: Im

$$V_{OUT} = \frac{318\angle -90}{1000 + (-96.2)j}$$

$$= \frac{318\angle -90}{1,004\angle -5.5^{\circ}}$$

$$\frac{84.5}{360} \cdot 1ms = t_d$$

$$\boxed{t_d = .234ms}$$

$$\tan^{-1}\frac{-96.2}{1000} = -5.5^{\circ}$$

$$V_{OUT} = 316mV\angle -84.5^{\circ}$$

$$\theta = \frac{t_d}{T \to 1ms} \cdot 360$$