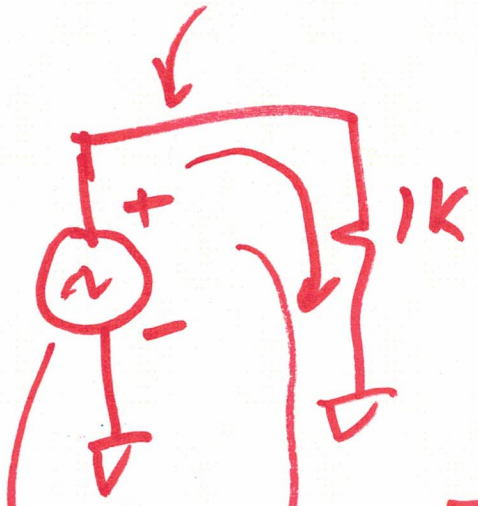
EE 221 Circuits II

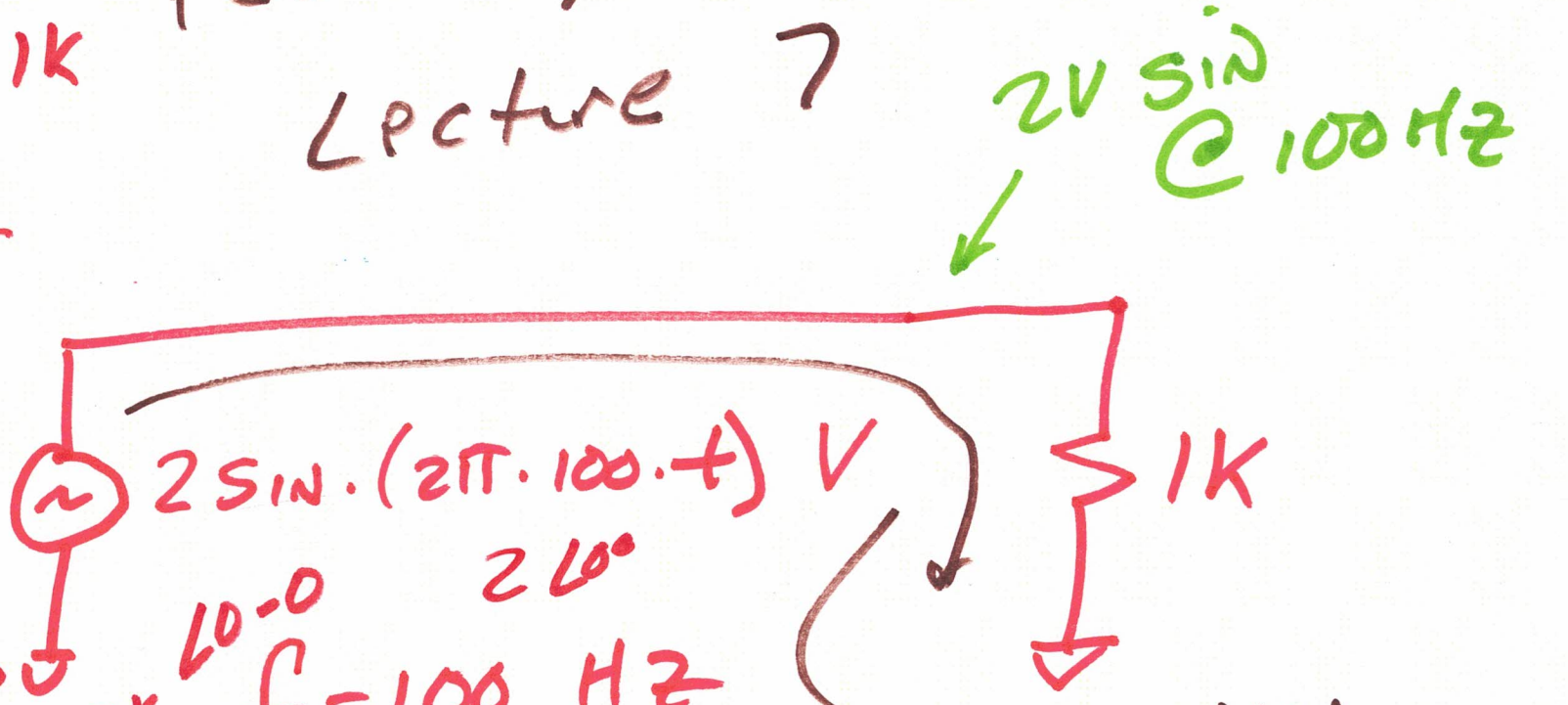
Feb. 13, 2019

Lecture 7



2∠0°

f=100



$\bar{I} = \frac{2\angle 0^\circ}{1K\angle 0^\circ} = \frac{2K}{1K}\angle 0-0$

$I = 2mA\angle 0^\circ$

$2\angle 0^\circ$

$f = 100\ Hz$

$T = \frac{1}{f} = 10ms$

$i(t) = \frac{v(t)}{R} = \frac{2\sin(2\pi 100 t)}{1K}$

$i(t) = 2mA \sin(2\pi 100 \cdot t)$

$s = \sigma + j\omega$

$-V = ?$

$2\angle 90^\circ$ ~ $2\cos(2\pi \cdot 100 \cdot t)$

$2\sin(2\pi \cdot 100 \cdot t + 90^\circ)$

$I?$

$1\,\mu F$

$j(-1{,}592)$

$Z_C = \frac{1}{j \cdot 2\pi \cdot f \cdot C}$

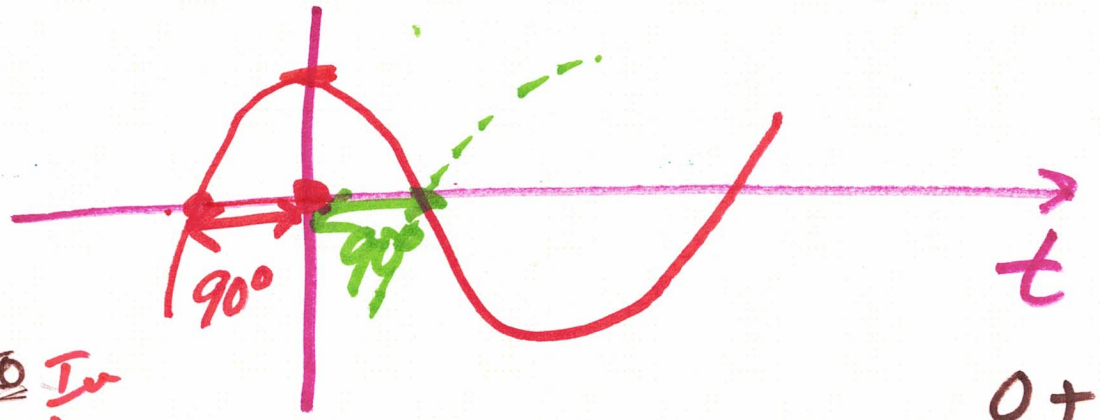
$= \frac{1}{j\omega C}$

$100 \cdot 10^{-6}$

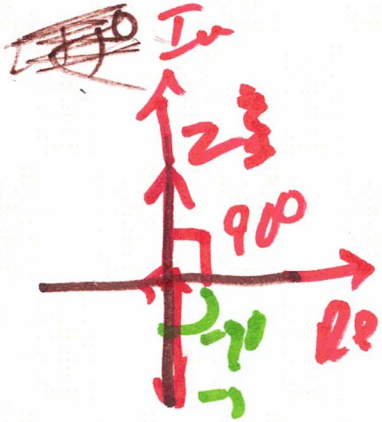
10^{-4}

$= \frac{1}{sC}$

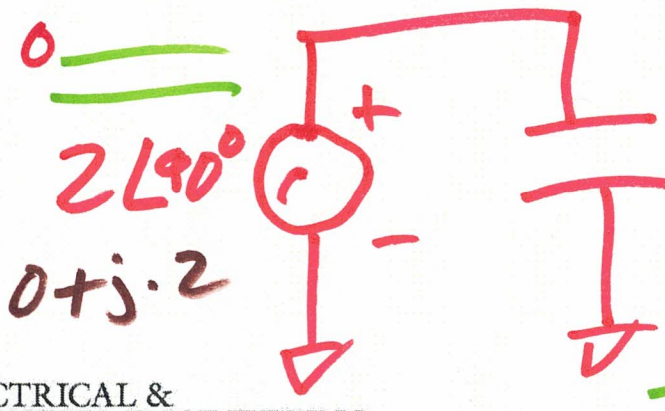
$Z_C = \frac{1}{j\omega C}$



$0 + j(-1.592k)$



$0 + j \cdot 2$



$1{,}592\angle -90^\circ$

$$\frac{A\angle\theta_1}{B\angle\theta_2} = \frac{A}{B}\angle\theta_1 - \theta_2$$

$$A\angle\theta \cdot B\angle\theta_2 = AB\angle\theta_1 + \theta_2$$

$$\vec{I} = 1.26\,mA\angle 180^\circ$$

$$= 1.26\,mA\ \sin(2\pi \cdot 100 + 180^\circ)$$

$$= -1.26\,mA\ \sin(2\pi 100 t)$$

$$\vec{I} = \frac{2\angle 90^\circ}{1{,}592\angle -90^\circ}$$

impedance = $R + j\,\text{reactance}$

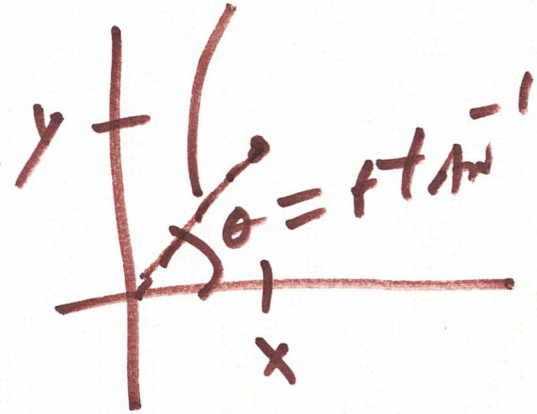
$$x = r\cos\theta$$

$$y = r\sin\theta$$

$$x + jy$$

$$r = \sqrt{x^2 + y^2}$$

$$r = \sqrt{y^2 + x^2}$$

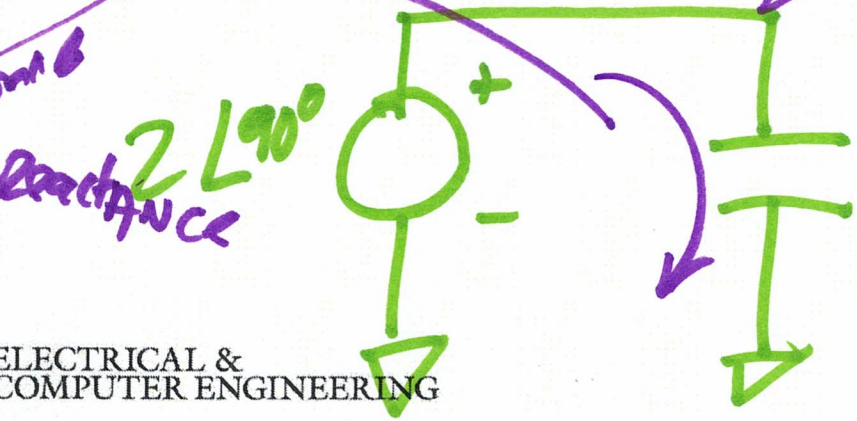


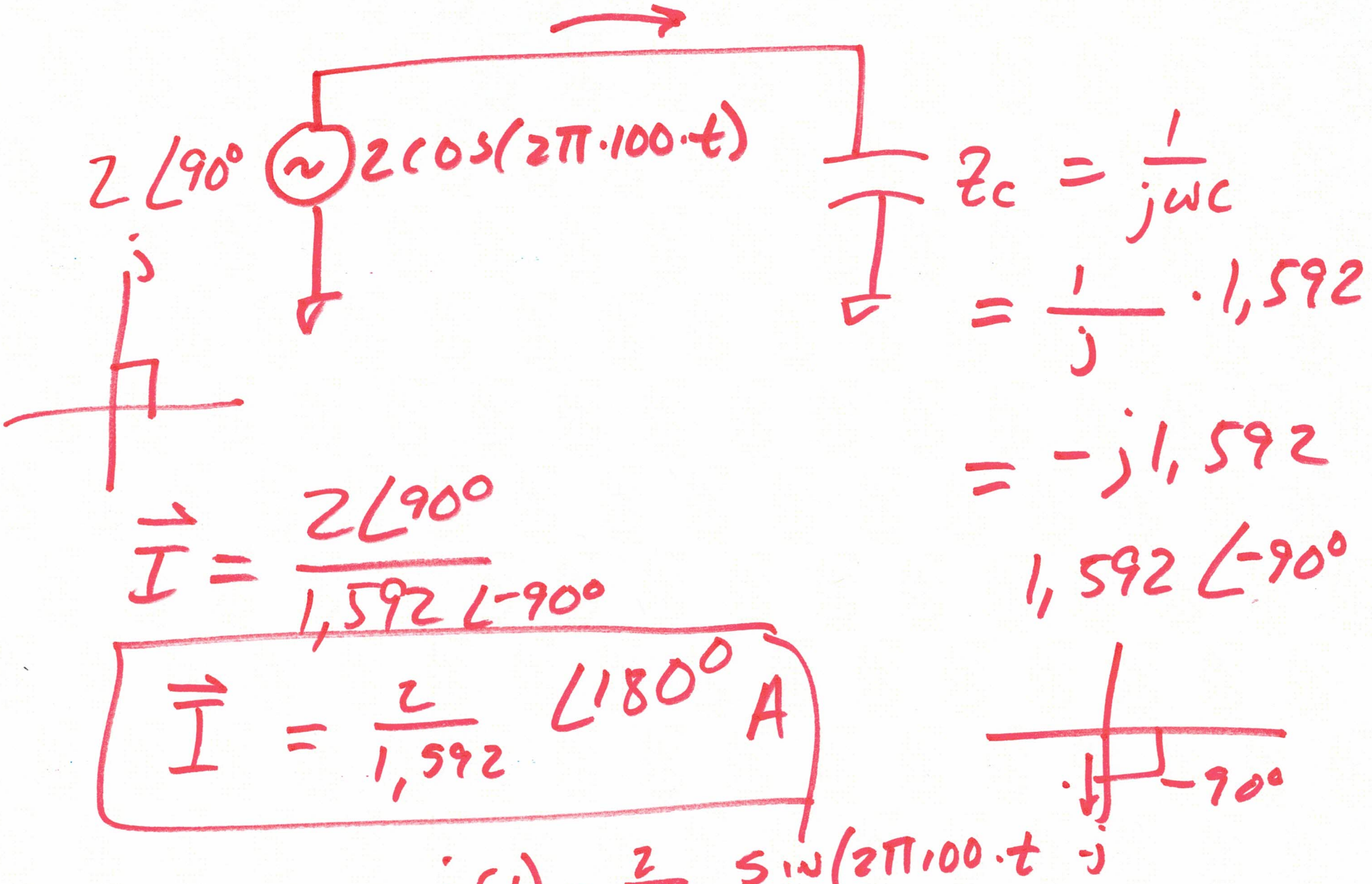
$$\theta = \tan^{-1}\frac{y}{x}$$

$$2\angle 90^\circ = \vec{V}$$

$$2\sin(2\pi \cdot 100 \cdot t + 90^\circ)$$

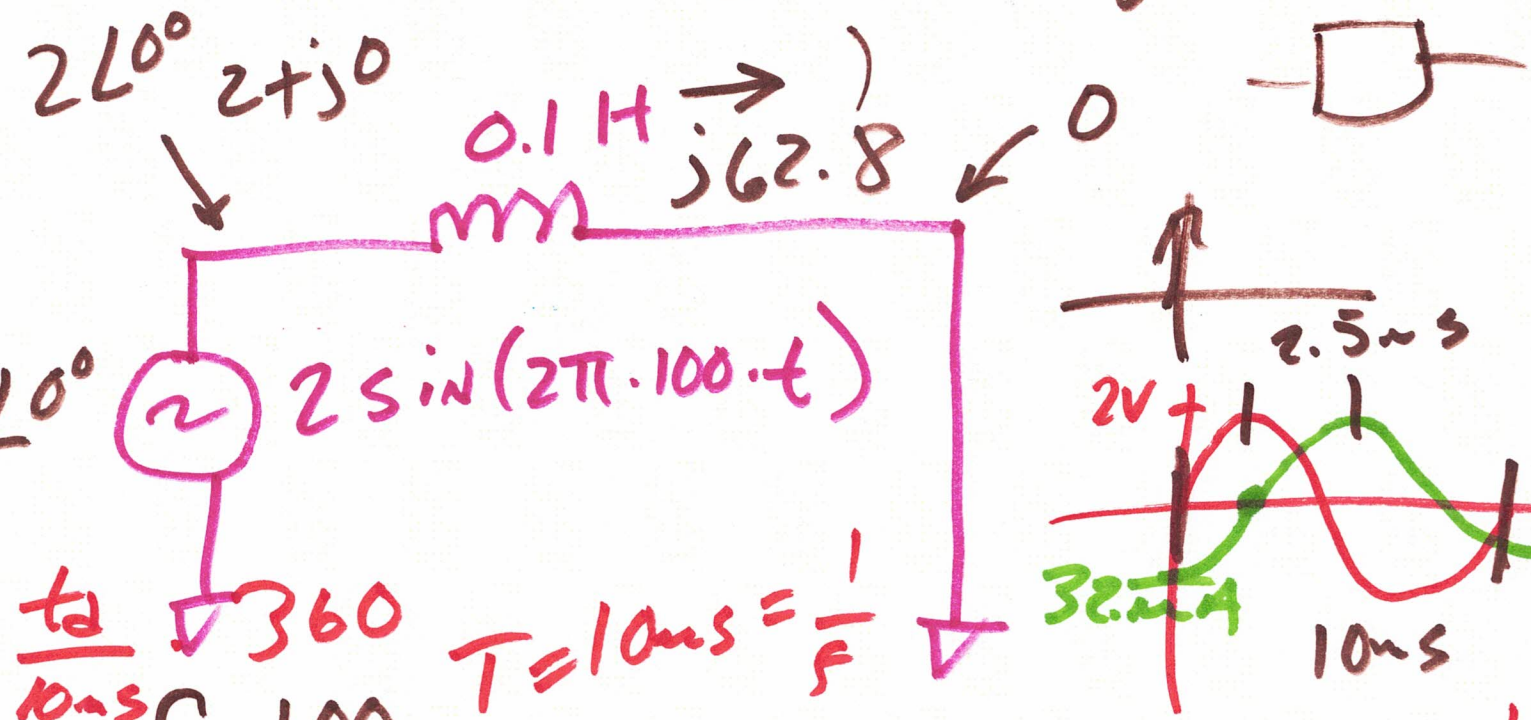
$$2\cos(2\pi \cdot 100 \cdot t)$$




2∠90°
2cos(2π·100·t)
j
$Z_C = \frac{1}{j\omega C}$
$= \frac{1}{j} \cdot 1,592$
$= -j\,1,592$
$1,592\angle -90°$
$\vec{I} = \frac{2\angle 90°}{1,592\angle -90°}$
$\vec{I} = \frac{2}{1,592}\angle 180°\ A$
-90°
-j
$i(t) = \frac{2}{1,592}\sin(2\pi 100 \cdot t + 180)$

$Z_L = j\omega \cdot L$ $\quad j \cdot 2\pi \cdot 100 \cdot 0.1$

$62.8\angle 90^\circ$ $\quad j\,62.8\ \Omega$



$90^\circ = \frac{t_d}{10ms} \cdot 360$ $\quad f = 100,\ T = 10ms = \frac{1}{f}$

$\theta = \frac{t_d}{T} \cdot 360$

$I = \frac{2\angle 0^\circ}{62.8\angle 90} = 32mA\angle -90^\circ$

$t_d = \frac{T}{4} = 2.5ms$

$i(t) = 32.mA\ \sin(2\pi \cdot 100 \cdot t - 90)$

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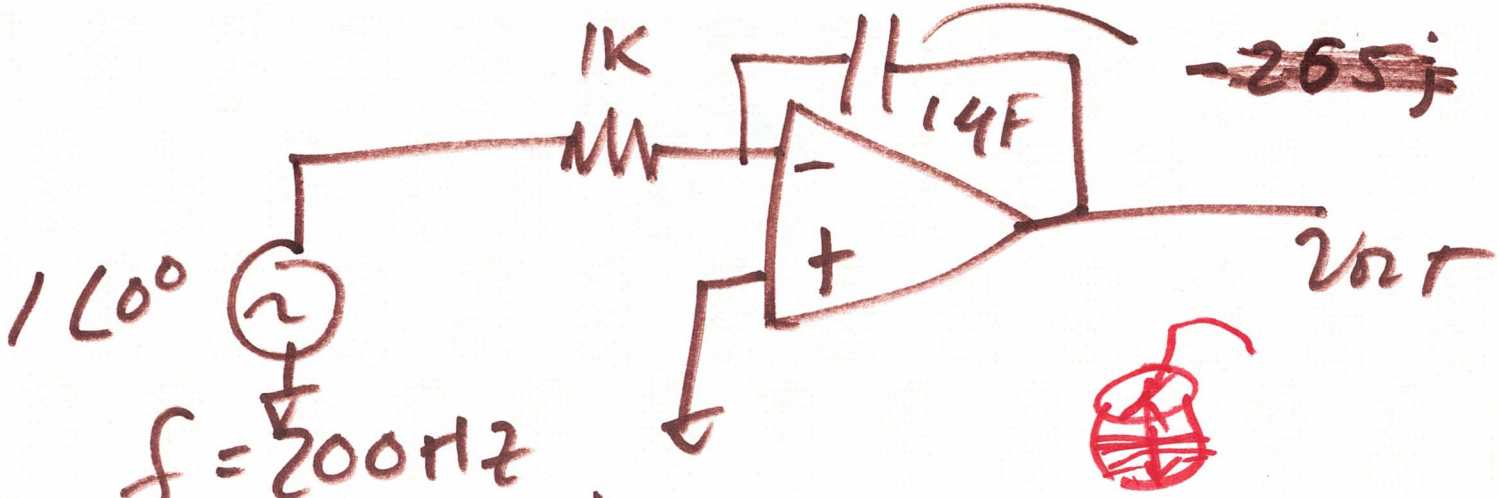
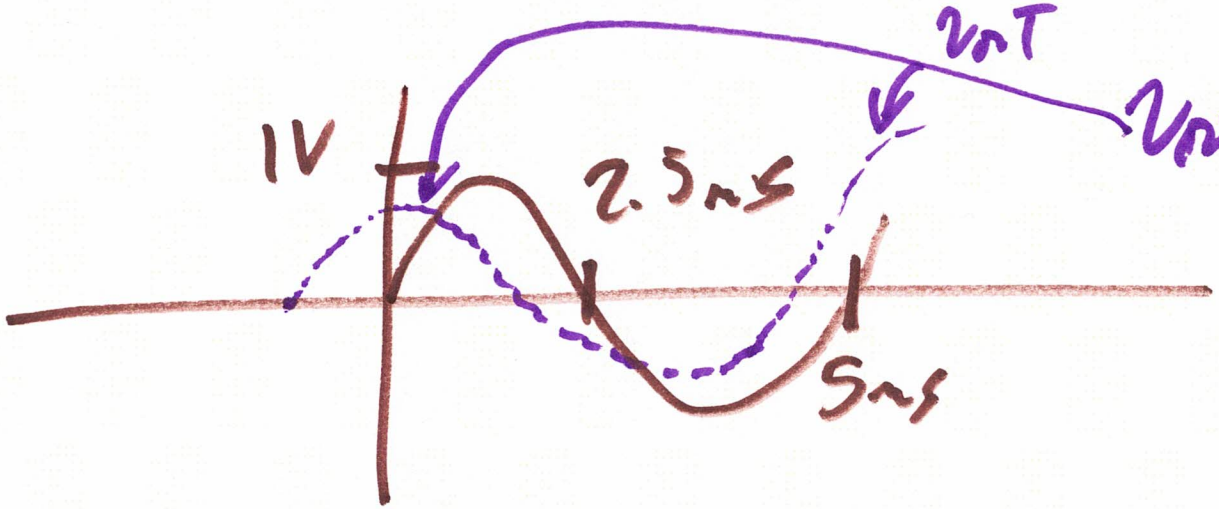
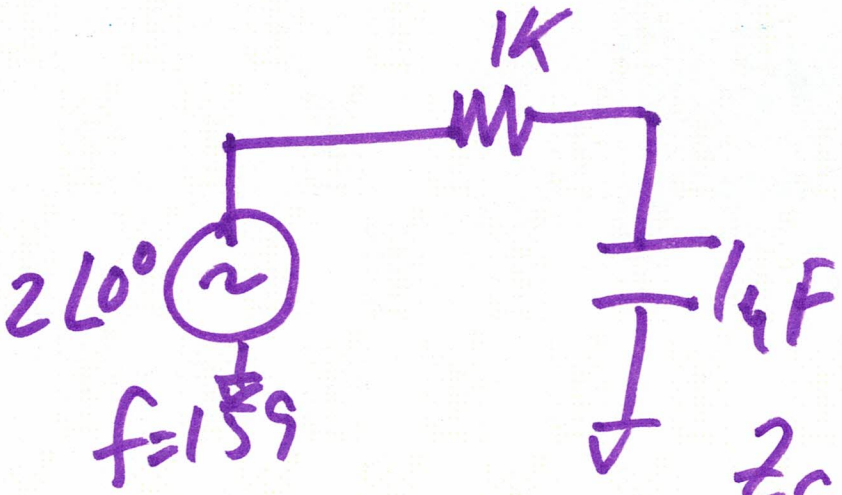


$= \frac{1}{f} = \frac{1}{5ms}$

$V_{OUT} = 1\angle 0° = -\frac{-j796}{1k} = j.796$



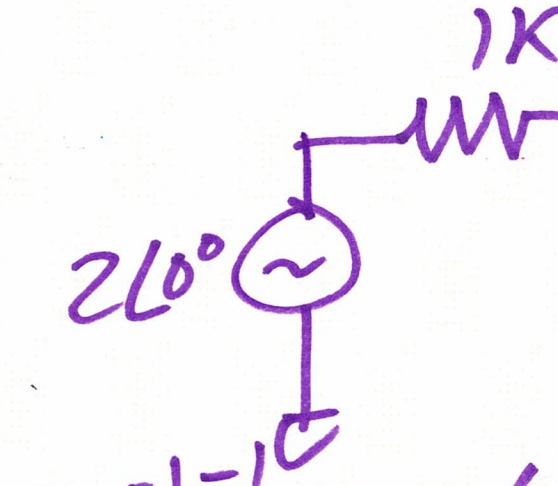
$V_{out} = 0.796V \cdot \sin(2\pi \cdot 200 \cdot t + 90)$



$0 + j(-1)$

$1\angle -90°$

$$Z_C = \frac{-j}{2\pi \cdot 159 \cdot 10^{-6}} \approx 1K \cdot (-j)$$



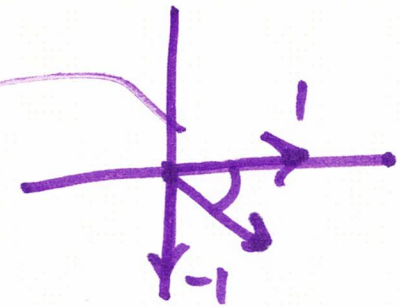
$$Z_{oT} = 2\angle 0° \cdot \frac{0 + j(-1K)}{1K + j(-1K)}$$

$$\tan^{-1}\frac{-1}{1} = -\tan^{-1}1 = -45°$$

$$1 + j(-1) = \sqrt{1^2 + (1)^2} = \sqrt{2}$$

$$= \frac{2\angle 0° \cdot 1\angle -90°}{\sqrt{2}\angle -45°}$$

$$= \frac{2}{\sqrt{2}}\angle -45°$$



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