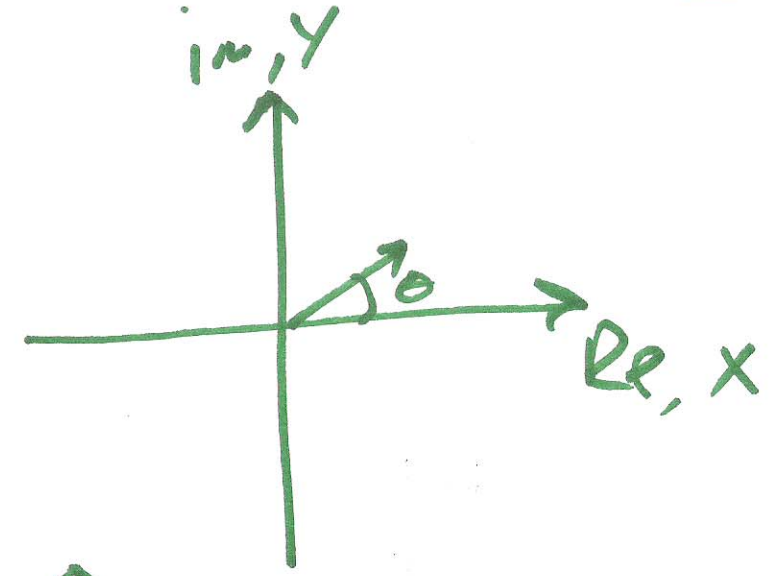
EE 220D

$\theta = \tan^{-1}\frac{Y}{X}$ JUNE 20, 2014

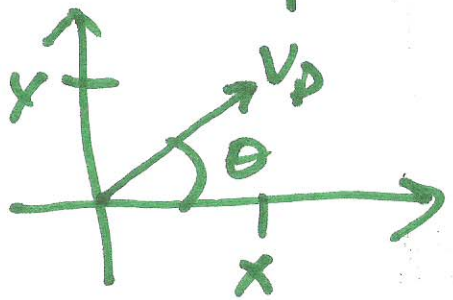
Lecture 6D



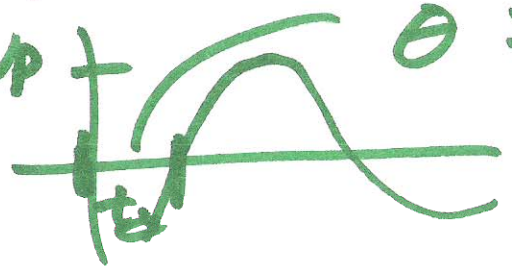
$V_p \angle\theta$; $V_p = \sqrt{x^2+y^2}$

$x = V_p \cos\theta$

$y = V_p \sin\theta$



$V_p \angle\theta^\circ \Leftarrow X + jY$



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

$$\left|\frac{1}{a+jb}\right| \qquad \angle\frac{1}{a+jb}$$

$$\frac{1}{a+jb}\cdot\frac{a-jb}{a-jb}$$

complex conjugate

$$\frac{a-jb}{a^2-jab+jab+b^2}$$

$$\frac{a}{a^2+b^2} + j\,\frac{-b}{a^2+b^2}$$

x $\qquad$ y

$$\sqrt{\frac{a^2}{(a^2+b^2)^2}+\frac{(-b)^2}{(a^2+b^2)^2}}$$

$$\sqrt{\frac{a^2+b^2}{(a^2+b^2)^2}}=\sqrt{\frac{(a^2+b^2)}{(a^2+b^2)(a^2+b^2)}}$$

$$\left|\frac{1}{a+jb}\right|=\frac{1}{\sqrt{a^2+b^2}}$$

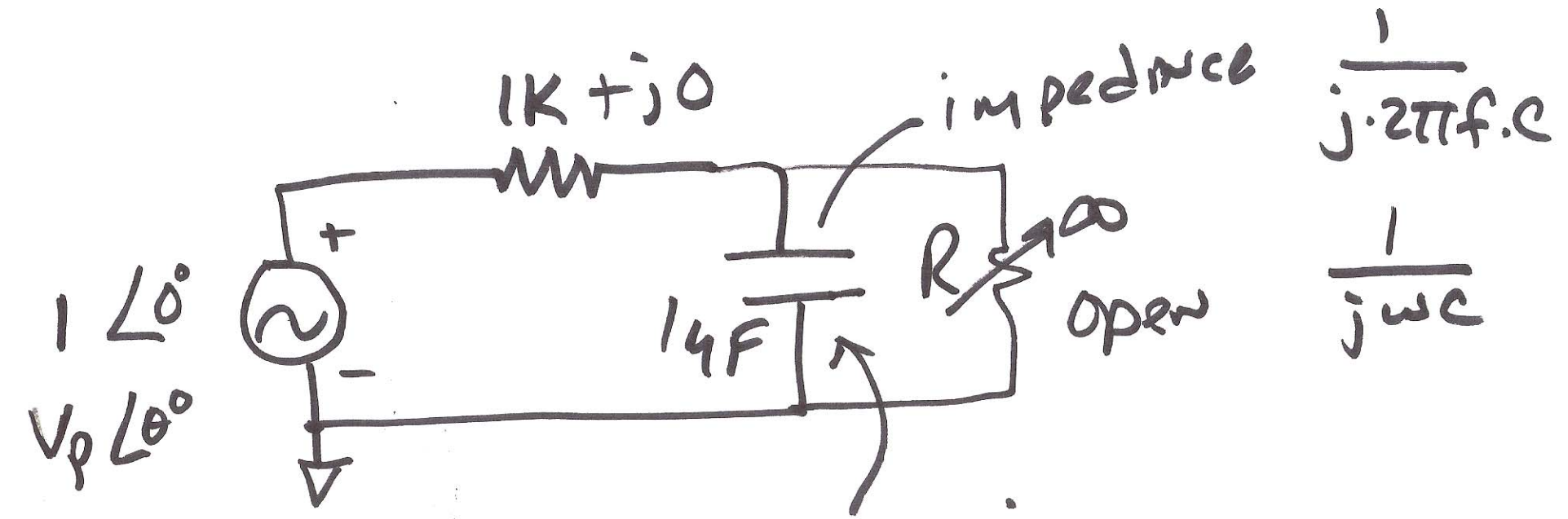
$$|a+jb|=\sqrt{a^2+b^2}$$

$$\angle \frac{1}{a+jb} \Rightarrow \tan^{-1}\frac{Y}{X}$$

$$\tan^{-1}\frac{\frac{-b}{a^2+b^2}}{\frac{a}{a^2+b^2}} = \tan^{-1}\frac{-b}{a}$$

$$\angle \frac{1}{a+jb} = -\tan^{-1}\frac{b}{a}$$

$$\angle a+jb = +\tan^{-1}\frac{b}{a}$$



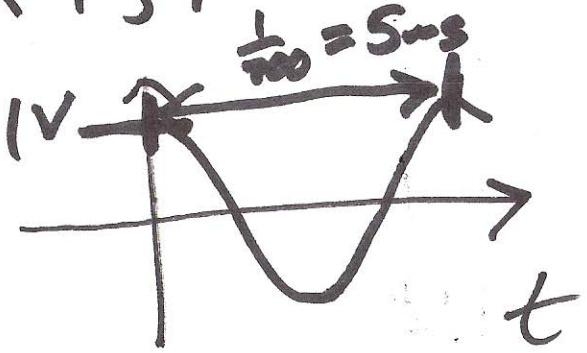
$$\frac{1}{j \cdot 2\pi f \cdot C}$$

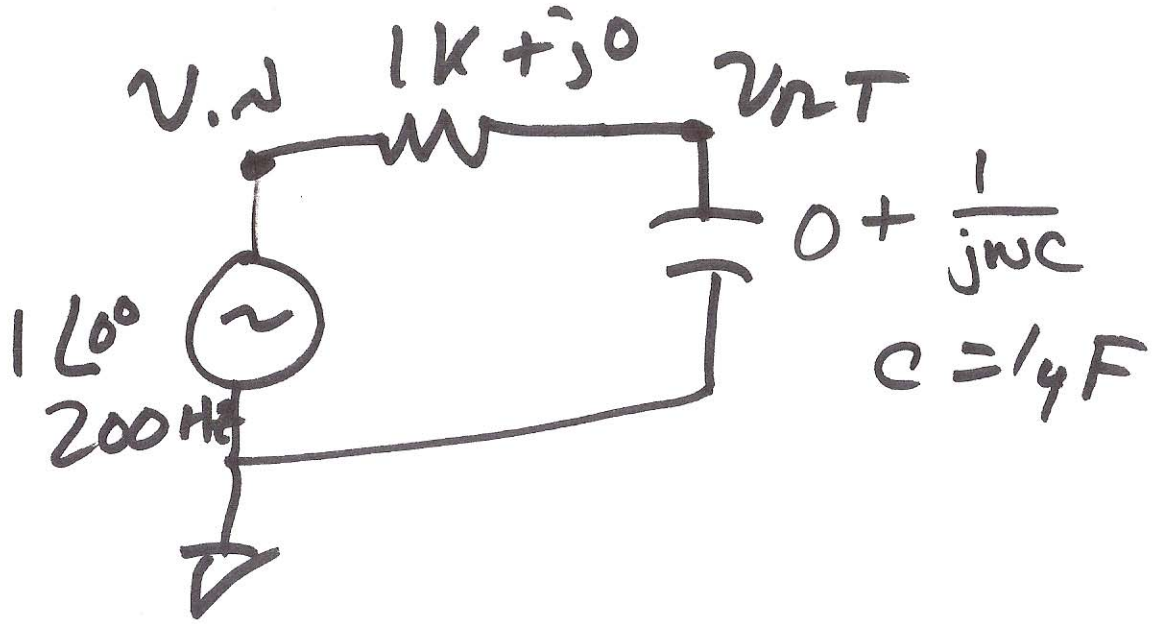
$$\frac{1}{j\omega C}$$

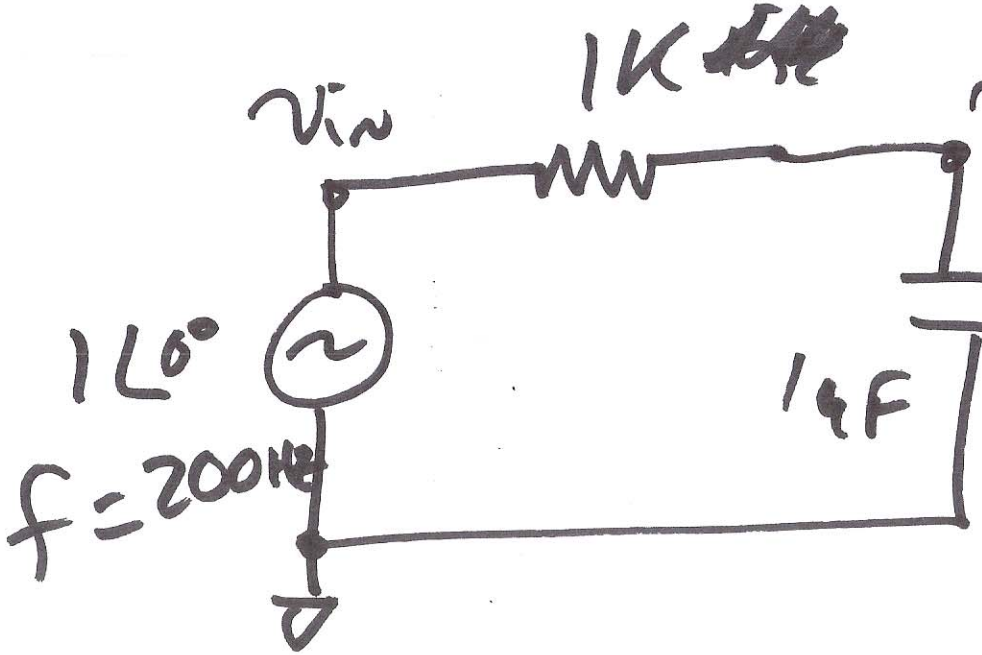
$x = V_p \cos\theta$

$y = V_p \sin\theta$

$X + jY = 1 + j \cdot 0$







impedance

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

$f = 200$

$C = 10^{-6}\,F$

$$V_{OUT} = V_{IN} \cdot \frac{\frac{1}{j\omega C} \cdot j\omega C}{\left(\frac{1}{j\omega C} + R\right) j\omega C}$$

$$V_{OUT} = \frac{V_{IN}}{1 + j\omega RC}$$

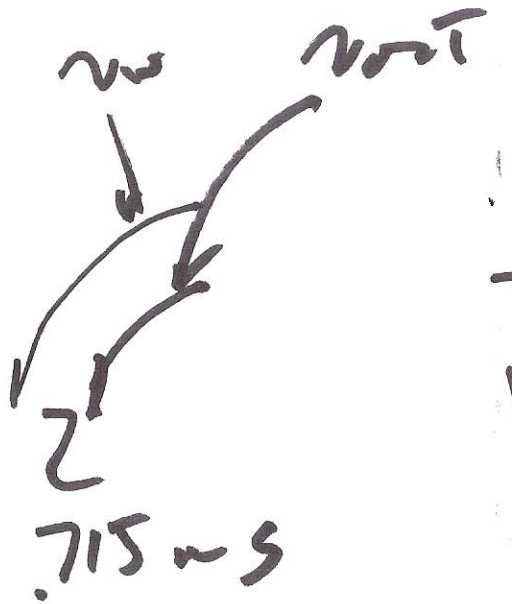
b)

RC = time

$f = \frac{1}{\text{time}}$

$$V_{out} = \frac{1 + j0}{1 + j1.256} \; V$$

$$= \left| \frac{1}{1 + j1.256} \right| \qquad \sqrt{1^2 + (1.256)^2} \qquad \angle + \tan^{-1} 1.256$$



$$\frac{1}{\sqrt{1^2 + (1.256)^2}} = .623 V$$

$$-\angle \tan^{-1} \frac{1.256}{1} = -.9 \text{ RAD lags}$$

$$.9 = \frac{t_1}{5ms} \cdot 2\pi \rightarrow -.715 ms$$

7)

$$\frac{1\angle 0^\circ}{1.605\angle .9} = \frac{1}{1.605}\angle 0 - .9$$

$$= .623\angle -.9 \text{ RAD}$$