

EE 220 circuits 1

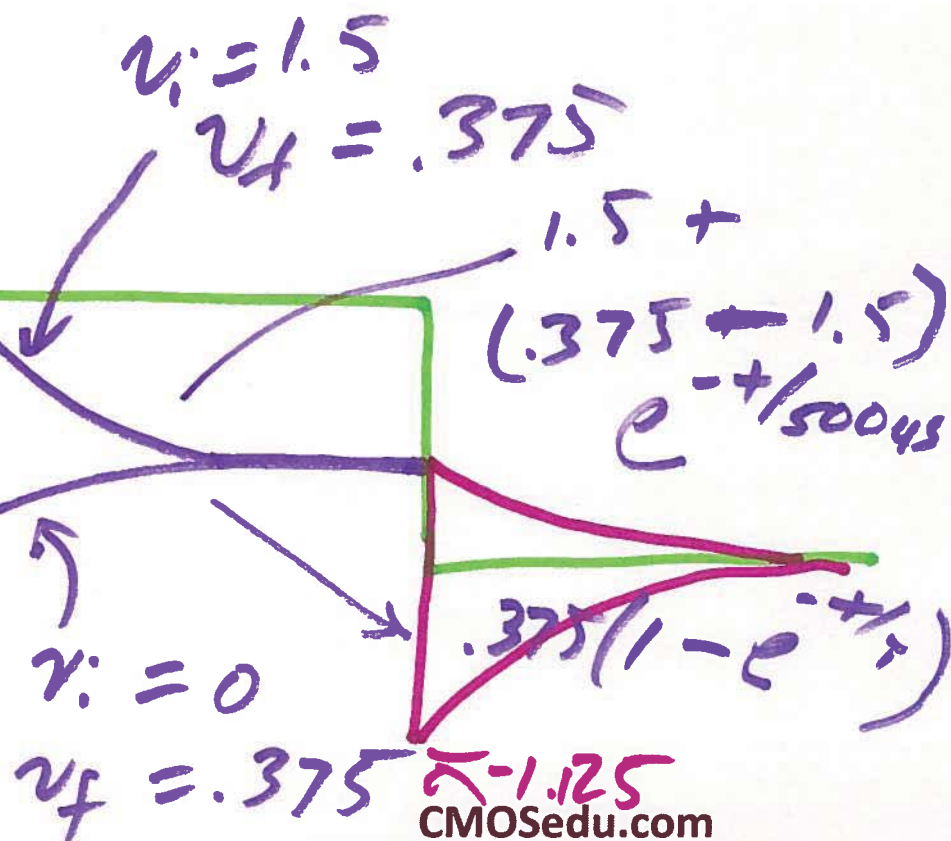
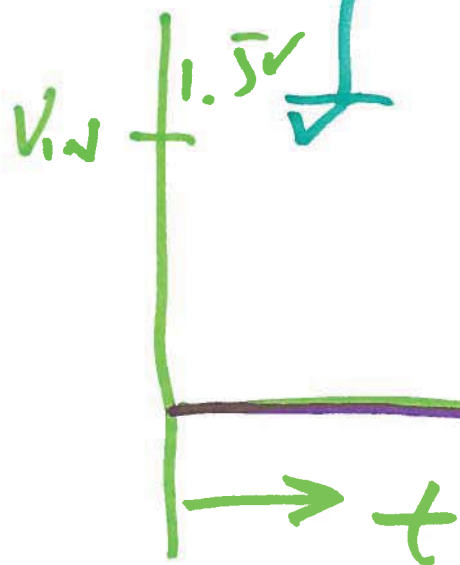
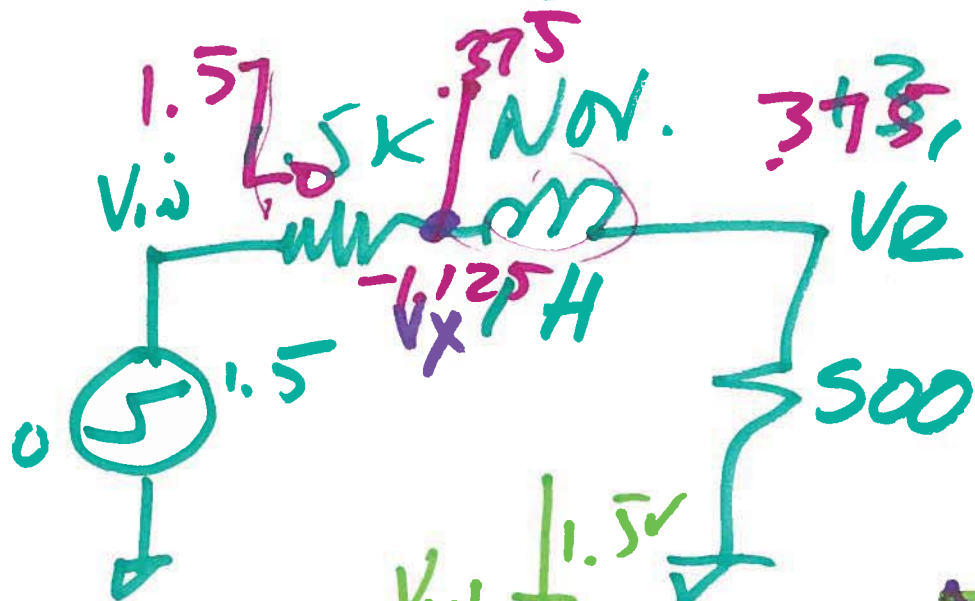
Lecture

21

$$v_f + (v_i - v_f)e^{-t/\tau}$$

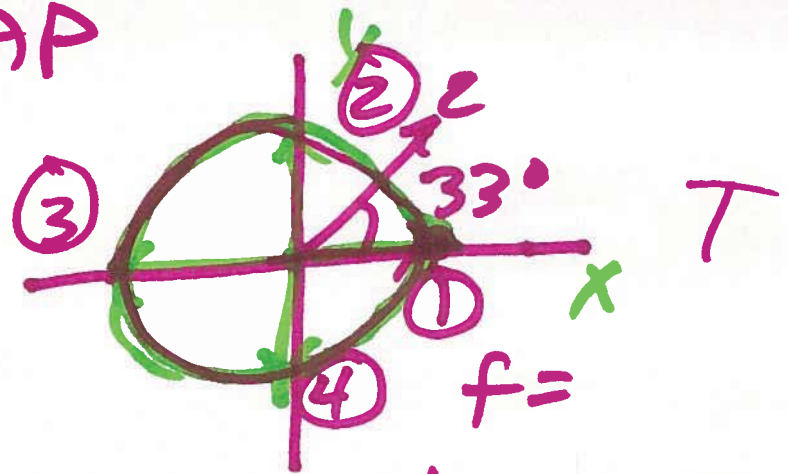
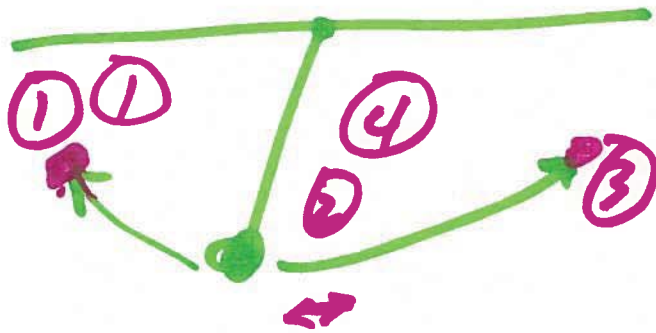
2017

$$\tau = \frac{L}{R} = \frac{1.5k}{500}$$



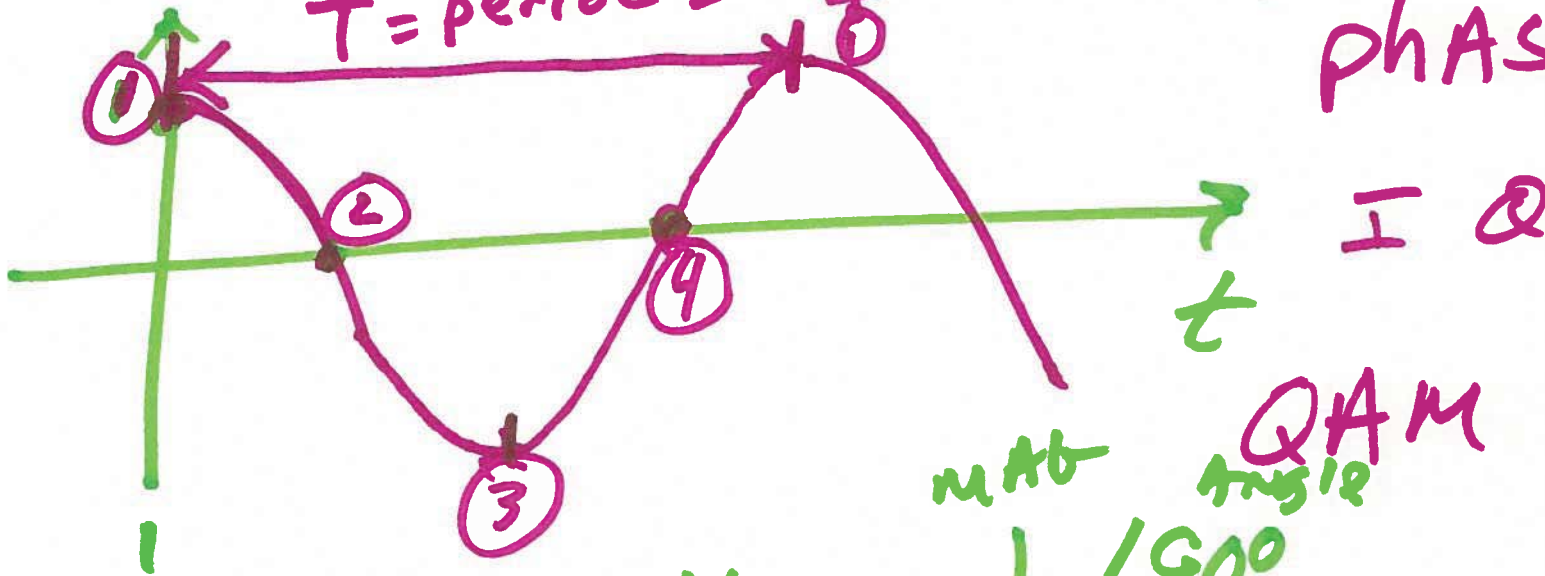
1)

WAP



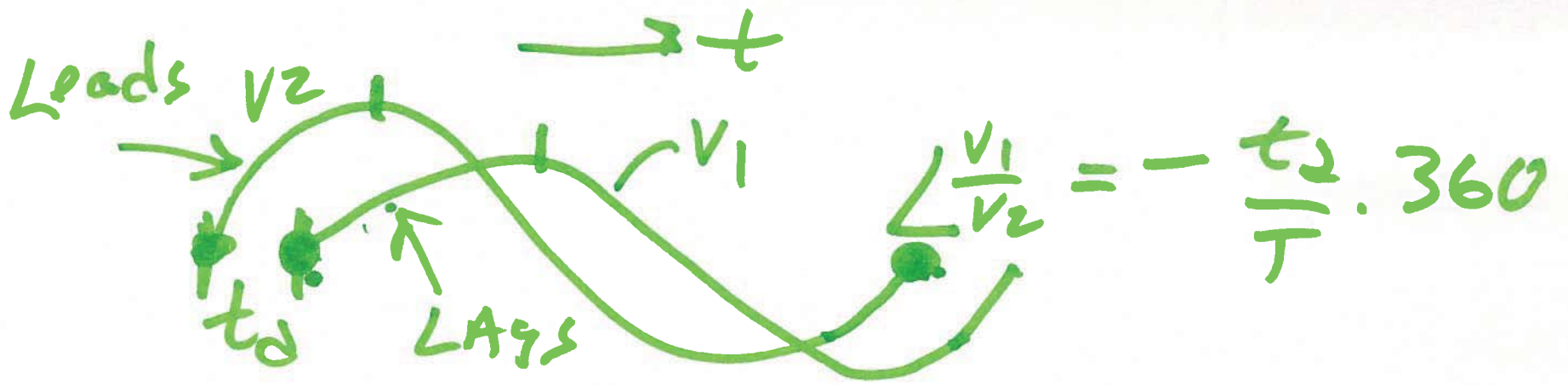
phasor

$T = \text{period} = \frac{1}{f}$



$V_{in} = 1 \angle 90^\circ$
 nAB
 QAM
 angle
 phasor

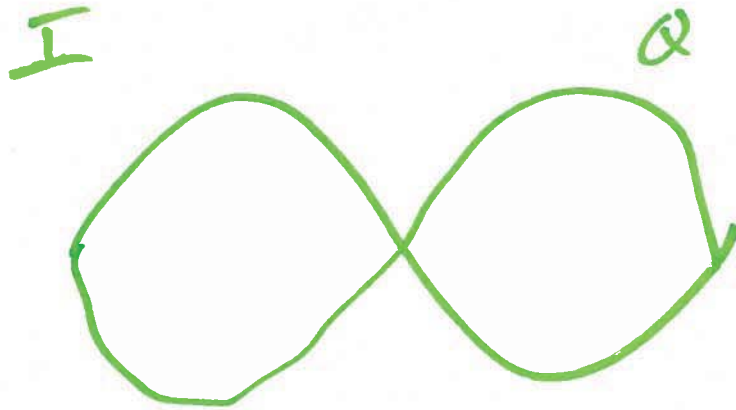
2)



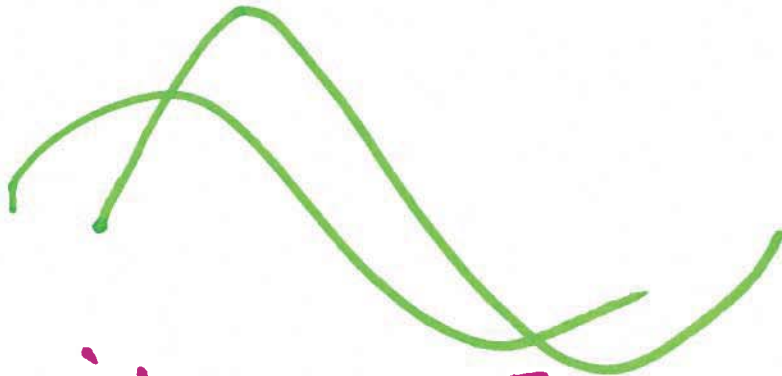
$$\theta = \frac{t_d}{T} \cdot 360 = t_d \cdot f \cdot 360$$

↑ PHASE shift

↑ % of period



I
 Q

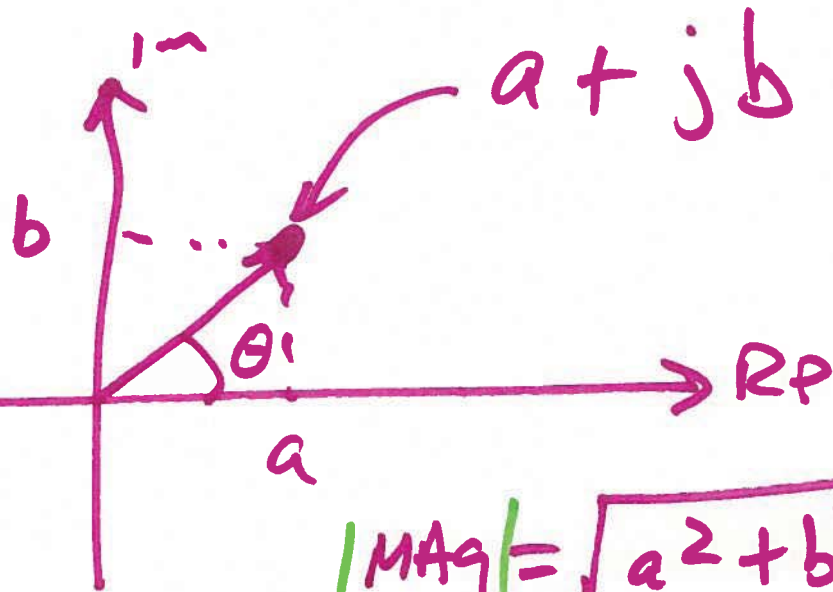


$$e^{jk} = \overset{I}{\cos k} + j \overset{Q}{\sin k}$$

Euler's identity

MAGNITUDE

$$\frac{c}{c^2+d^2} + j \frac{-d}{c^2+d^2}$$



$$\left(\frac{1}{c + jd} \right) \cdot \frac{c - jd}{c - jd}$$

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

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

$$\angle \frac{1}{c + jd}$$

$$a = (\cos \theta) \cdot \text{mag}$$

$$b = (\sin \theta) \cdot \text{mag}$$

$$| | = \sqrt{\left(\frac{c}{c^2+d^2} \right)^2 + \left(\frac{-d}{c^2+d^2} \right)^2}$$

$$= \frac{1}{\sqrt{c^2+d^2}}$$

5)

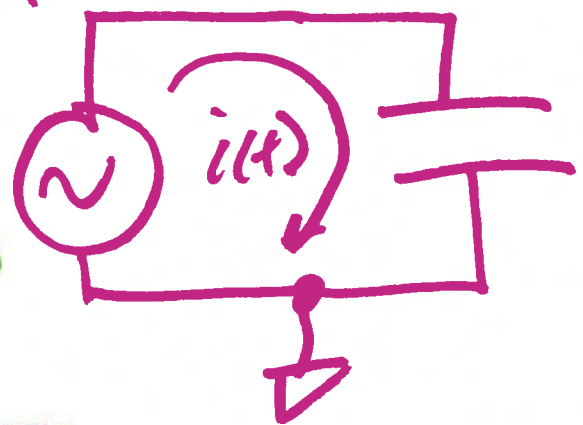
$$|\text{MAG}| = \left| \frac{1}{a + jb} \right| = \frac{1}{\sqrt{a^2 + b^2}}$$

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

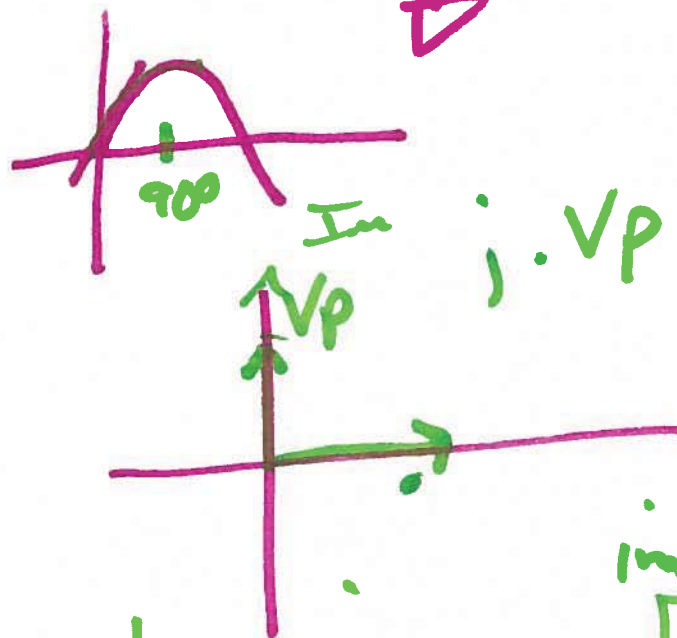
$$|\text{MAG}| = |a + jb| = \sqrt{a^2 + b^2}$$

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

$V_p \sin 2\pi f \cdot t$
 $V_p \angle 90^\circ$



$$v_c(t) = V_p \sin 2\pi f \cdot t$$



$$i(t) = C \frac{d v_c(t)}{\omega dt}$$

$$= C \frac{V_p \cdot \cos 2\pi f \cdot t}{V_p \cos 2\pi f \cdot t}$$

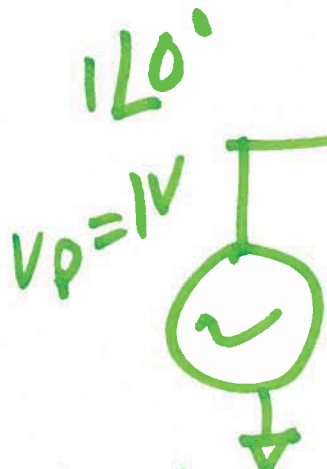
impedance =

$$i = \frac{V \cdot \omega}{j\omega C}$$

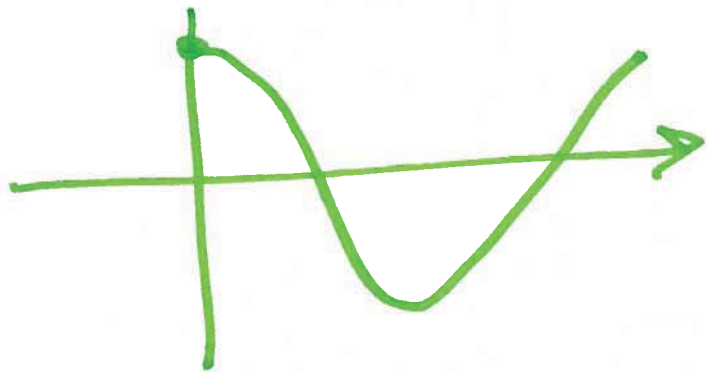
$$V = \frac{1}{j\omega C} \cdot i$$

↑ impedance

7) $V = j\omega L \cdot i$



$f = 1 \mu\text{Hz}$



14F $v_c(j\omega) = 120^\circ$

$$i_c = \frac{v_c}{\frac{1}{j\omega C}} = \frac{120^\circ}{j \cdot 2\pi \cdot 10^6 \cdot 10^{-6}}$$

$$= \frac{120^\circ}{.159 \cdot j} = \frac{120^\circ}{j}$$

$$= \frac{1}{.159} \angle 90^\circ = \frac{120^\circ}{.159 \angle -90^\circ}$$

$$= 6.28 \angle 90^\circ$$

8)