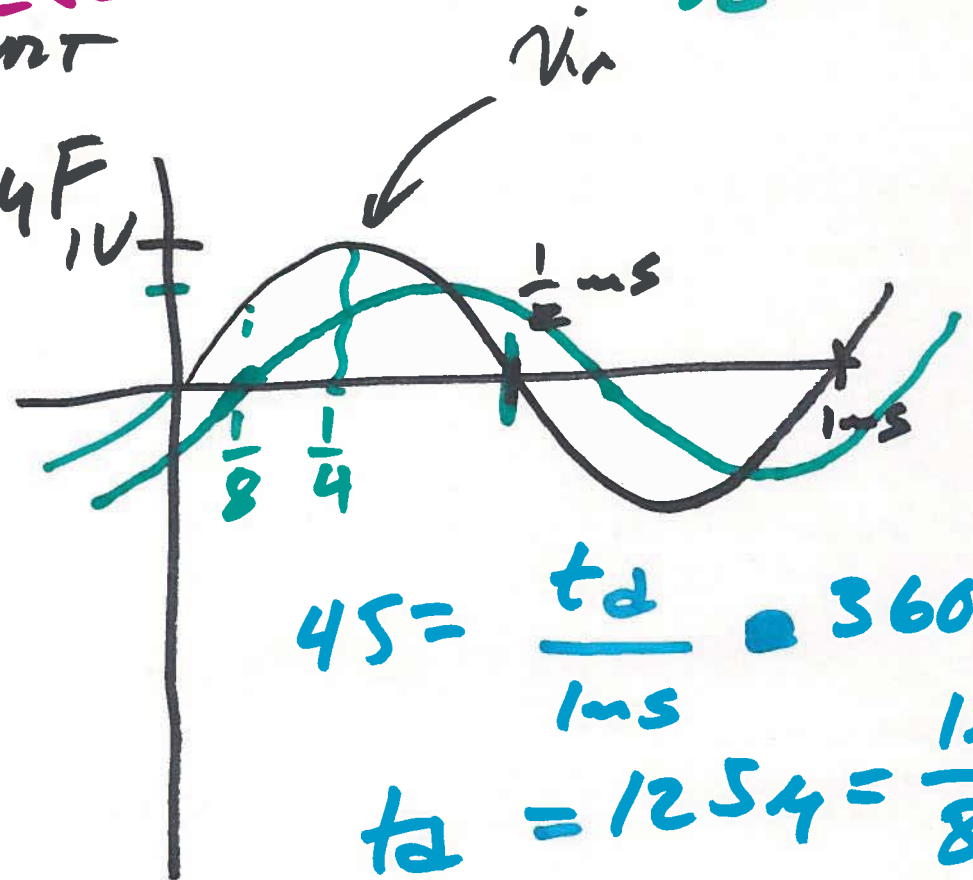
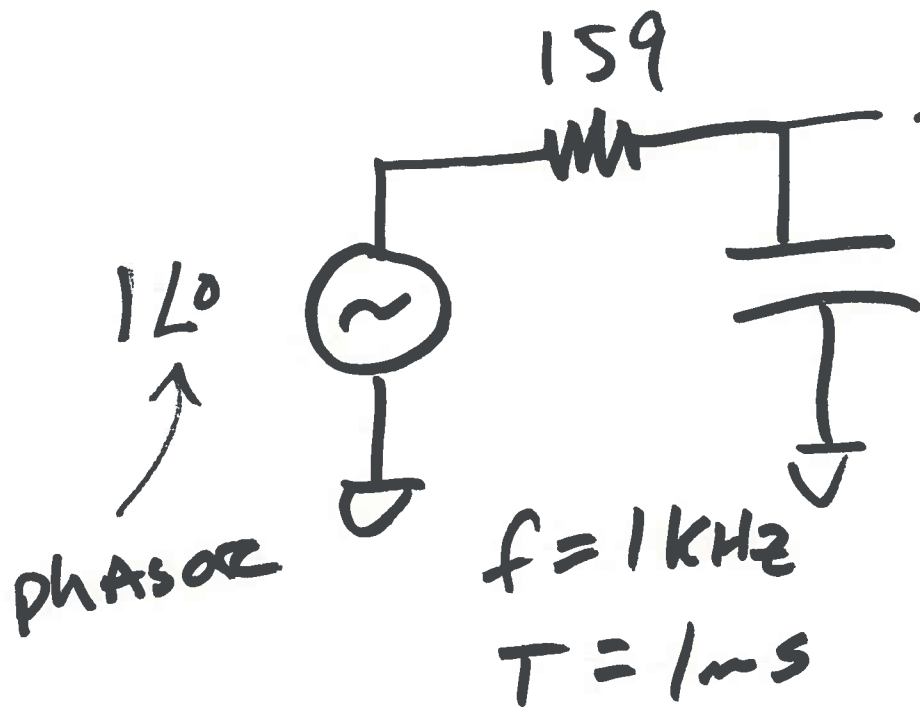


# EE 270 circuits 1

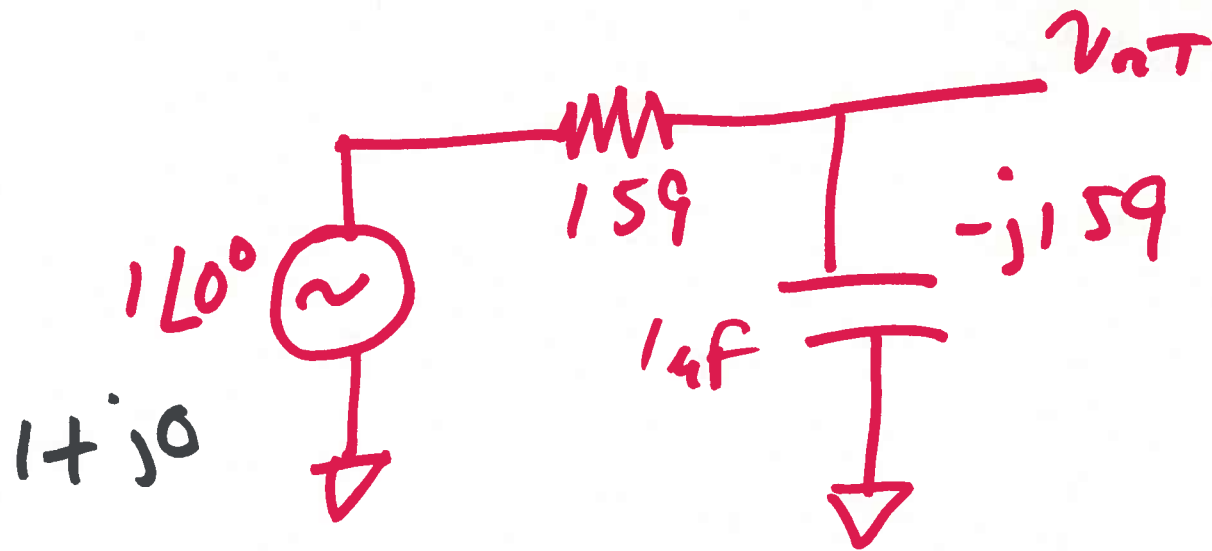
NOV. 21, 2018

Lecture 24  $\frac{1}{\sqrt{2}} = 0.707$



$$45 = \frac{t_d}{1 \mu\text{s}} \cdot 360^\circ$$
$$t_d = 125 \mu\text{s} = \frac{1 \mu\text{s}}{8}$$

1)



$$V_{OUT} = 1\angle 0^\circ \cdot \frac{-j159}{159 + j(-159)}$$

$$= 1\angle 0^\circ \cdot \frac{0 + j(-159)}{159 + j(-159)}$$

$$= \frac{1\angle 0^\circ \cdot 159\angle -90^\circ}{\sqrt{2} \cdot 159\angle -45^\circ}$$

impedance = Resistance + reactance  
 $\frac{1}{R} = \text{conductance}$

$$Z_C = \frac{1}{j2\pi f \cdot C}$$

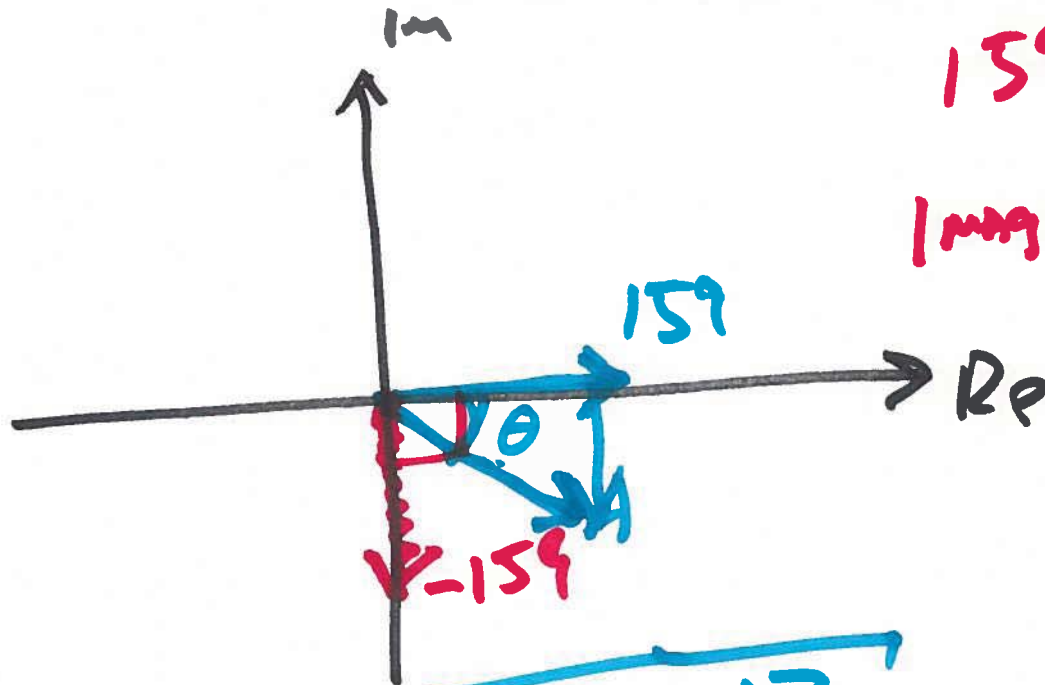
$$= \frac{1}{j\omega C}$$

$$= \frac{1}{sC}$$

$$\frac{1}{j \cdot 6.28 \cdot 10^3 \cdot 10^{-6}}$$

$$\frac{-j}{j \cdot 6.28 \cdot 10^3}$$

2)



$$159 \angle -90^\circ$$

$$|mag| = \sqrt{x^2 + y^2}$$

$$= \sqrt{159^2 + 159^2}$$

$$\angle \theta = \tan^{-1} \frac{Im}{Re}$$

even

$$f(-x) = f(x)$$

odd

$$f(-x) = -f(x)$$



$$2\pi = \frac{159 \angle -90^\circ}{\sqrt{2}}$$

$$V_{AT} = \frac{1}{\sqrt{2}} \angle -45^\circ$$

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

3)

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

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

$$A \angle \theta_1 + B \angle \theta_2 = A \cdot \cos \theta_1 + j A \cdot \sin \theta_1 + B \cos \theta_2 + j B \sin \theta_2$$

$$\text{Re} = A \cdot \cos \theta_1$$

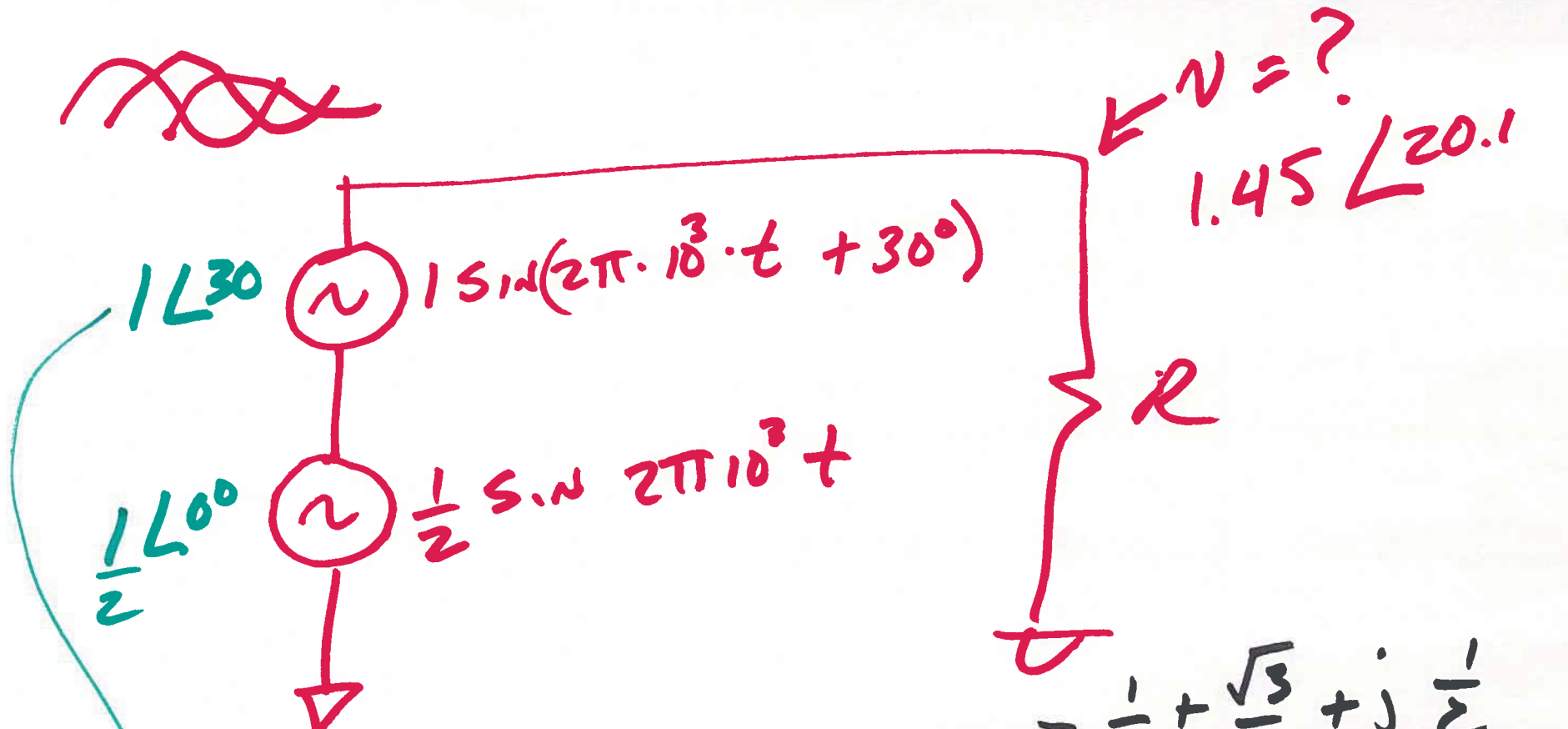
$$\text{Im} = A \cdot \sin \theta_1$$

$$\frac{A \angle \theta_1 \cdot B \angle \theta_2}{C \angle \theta_3}$$

$$= \frac{A \cdot B}{C} \angle \theta_1 + \theta_2 - \theta_3$$

$$A \cos \theta_1 + B \cos \theta_2$$

$$+ j (A \sin \theta_1 + B \sin \theta_2)$$

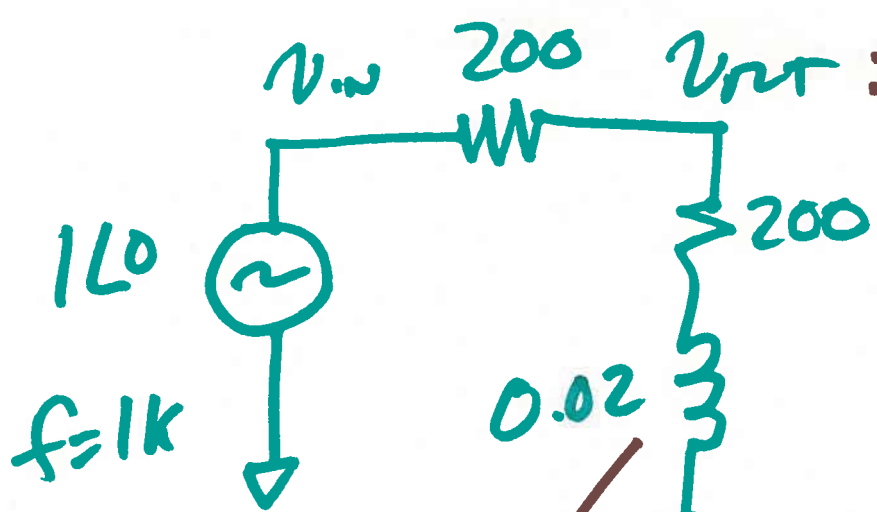


$1 \angle 30^\circ + \frac{1}{2} \angle 0^\circ$   
 $\text{Re} \quad \text{Im}$   
 $1 \cos 30 + j \sin 30 + \frac{1}{2} + j0$   
 $\frac{\sqrt{3}}{2} + j \frac{1}{2} + \frac{1}{2} + j0$

$\frac{1}{2} + \frac{\sqrt{3}}{2} + j \frac{1}{2}$   
 $1.366 + j \frac{1}{2}$   
 $\sqrt{(1.366)^2 + (\frac{1}{2})^2}$   
 $\rightarrow 1.45 \angle 20.1$   
 $20.1 = 360 \cdot \frac{td}{1-s}$

$1-s = \frac{20}{360} = \frac{1}{18} \text{ s} = 0.055 \text{ s}$

5)



$$\frac{200 + j125.6}{200 + 200 + j125.6}$$

$$\frac{(400)^2}{\sqrt{(200)^2 + (125.6)^2}} \quad 236$$

$$Z_L = j2\pi f \cdot L = j\omega L = 5L \angle \tan^{-1} \frac{125.6}{200} \quad 400$$

$$= j \cdot 6.28 \cdot 10^3 \cdot 0.02 \quad 32.1^\circ$$

$$= j125.6$$

$$v_{out} = 1.00 \cdot \frac{236 \angle 32.1^\circ}{419.3 \angle 17^\circ}$$

$$v_{out} = 0.56 \angle 15^\circ$$

$$t_d = \frac{15}{360} \cdot 1 \mu s$$

6)