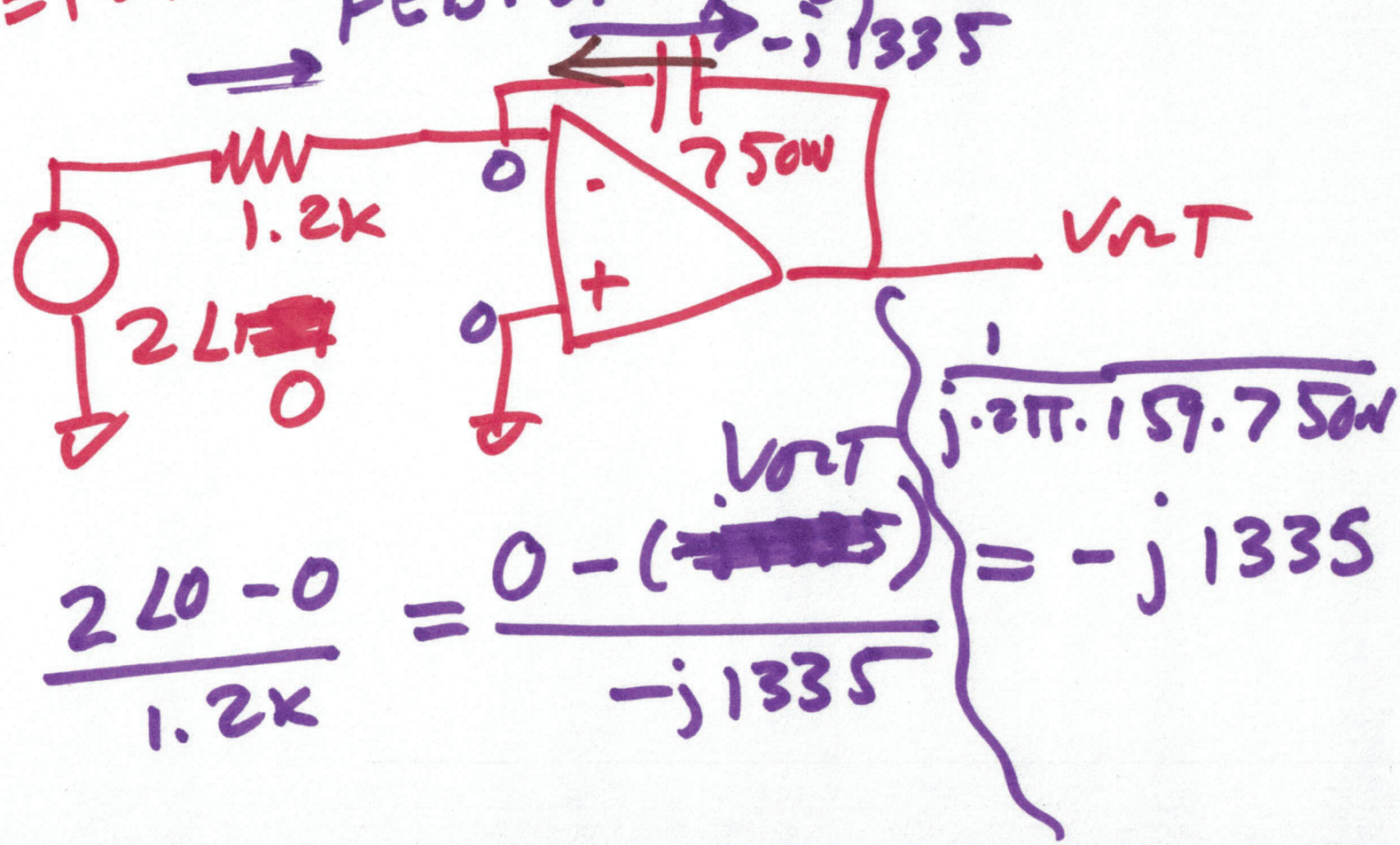
EE 221 CIRCUITS II

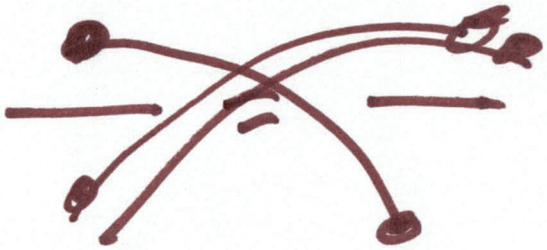
Lecture 7

f = 159 Hz February 8, 2023



$$\frac{2\angle 0 - 0}{1.2k} = \frac{0 - (\text{[redacted]})}{-j1335} = \frac{V_{OUT}}{\frac{1}{j \cdot 2\pi \cdot 159 \cdot 750\Omega}} = -j1335$$

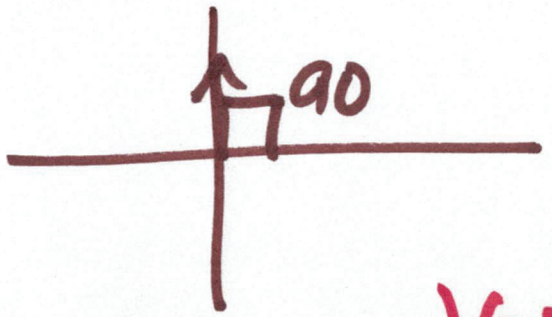
$$\frac{2\angle 0 - 0}{1.2k} + \frac{V_{OUT} - 0}{-j1335} = 0$$



$$\frac{2\angle 0}{1.2k} = \frac{+V_{OUT}}{+j1335}$$

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

$$\frac{A\angle\theta_1 \cdot B\angle\theta_2}{AB\angle\theta_1+\theta_2} \quad \frac{2\angle 0 \cdot j1335}{1.2k} = V_{OUT} \quad \tan^{-1}\frac{1335}{0}$$



$$0 + j1335 = 1335\angle 90$$

$$\sqrt{0^2 + 1335^2}$$

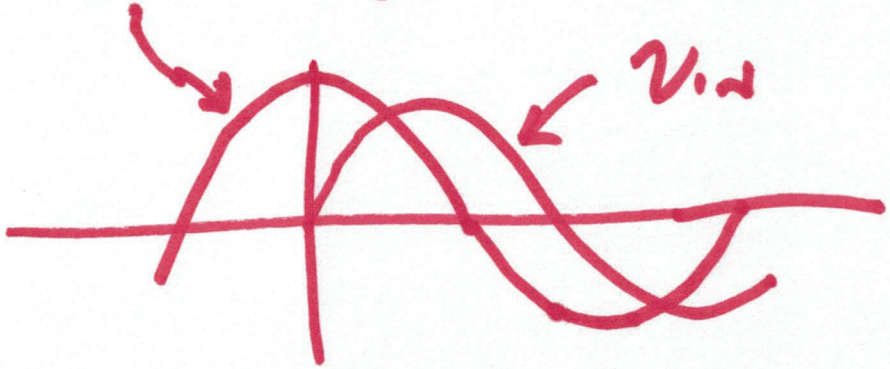
$$V_{OUT} = \frac{2\angle 0 \cdot 1335\angle 90}{1,200\angle 0}$$

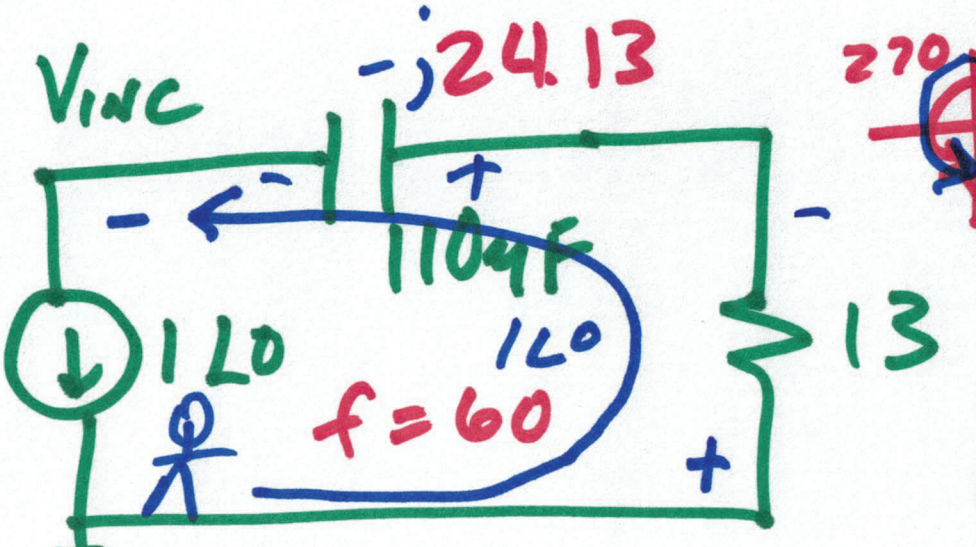
$$V_{OUT} = \frac{2 \cdot 1335}{1,200} \angle 90 + 0 - 0$$

$$= 2.225 \angle 90$$

$$v_{in} = 2 \sin(2\pi \cdot 159 \cdot t)$$

$$v_{OUT} = 2.225 \sin(2\pi 159 \cdot t + 90)$$





$$\frac{1}{j2\pi \cdot 60 \cdot 110_4}$$

$$= -j24.13$$

$$= 24.13\angle -90$$

$$= 24.13\angle 270$$

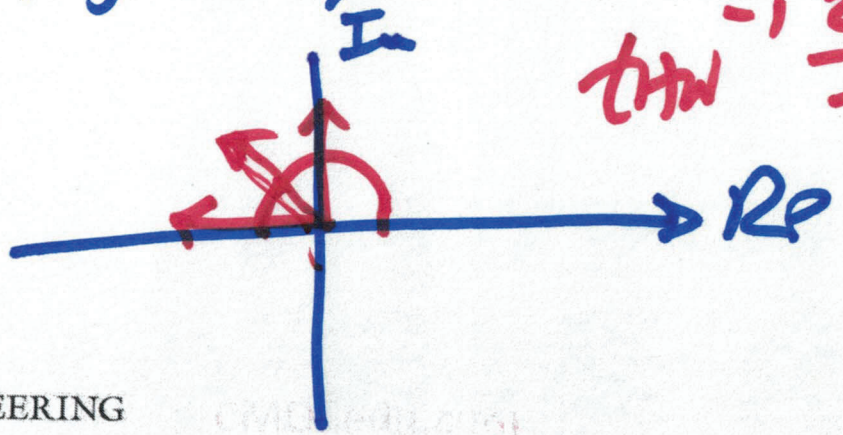
$$-(13 - j24.13).1\angle 0 = V_{INC}$$

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

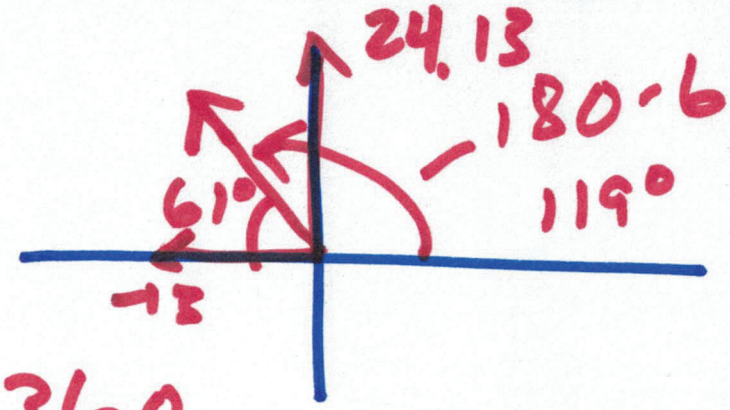
$$(-13 + j24.13).1\angle 0 = V_{INC}$$

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

$$\tan^{-1}\frac{24.13}{-13} = -61.$$



$$V_{1NC} = 1\angle 0 \cdot (-13 + j24.13)$$



$$\tan^{-1}\frac{24.13}{-13} = -61°$$

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

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

$$\theta = t_d \cdot f \cdot 360$$

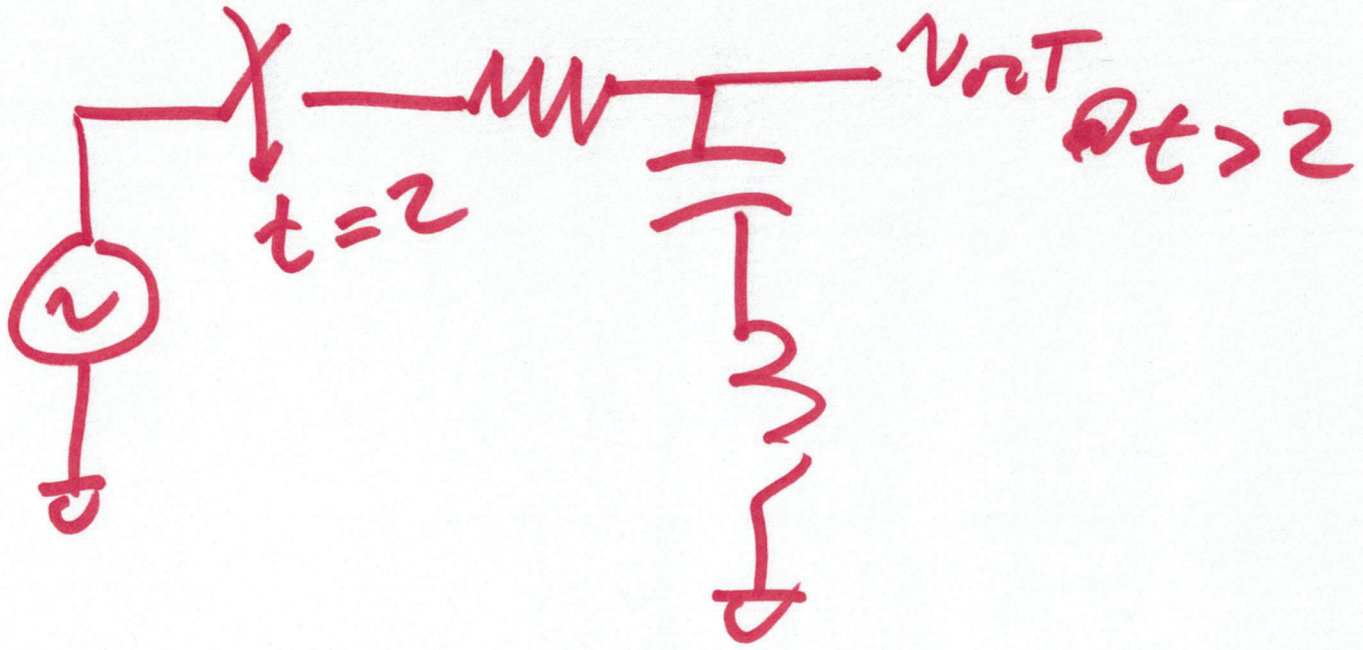
$$V_{1NC} = 1\angle 0 \cdot 27.4\angle 119$$

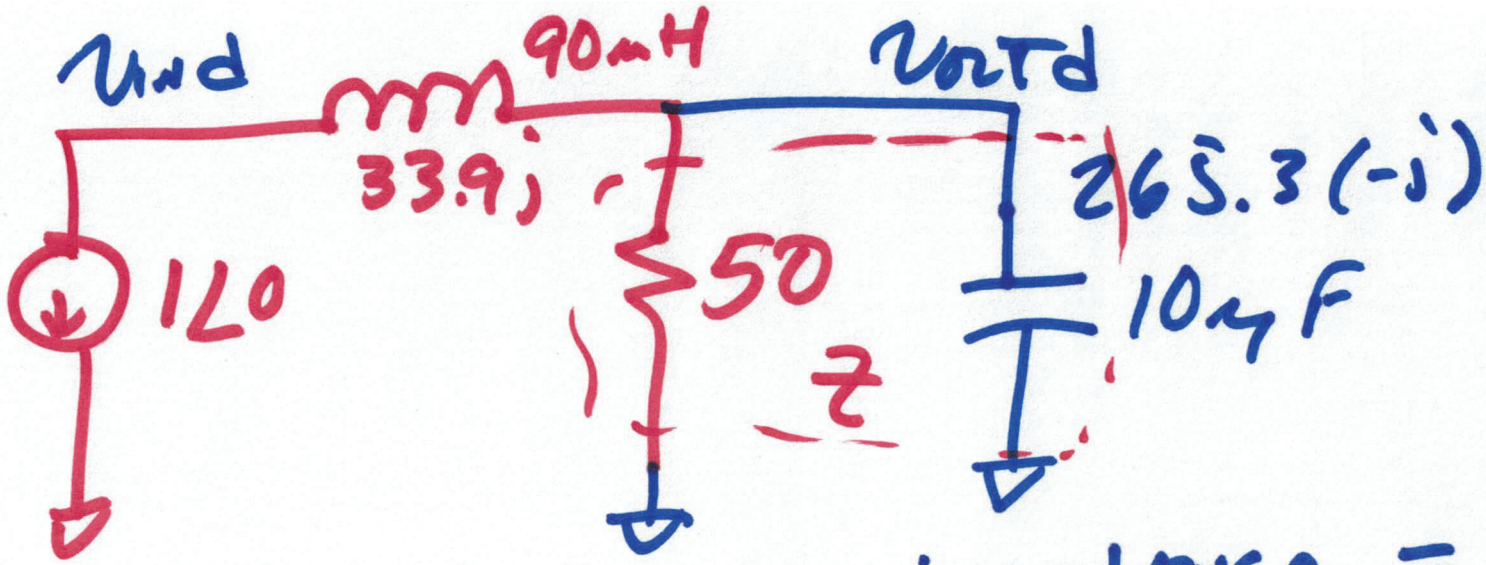
$$V_{1NC} = 27.4\angle 119$$

$$t_d = \frac{119 \cdot 16.67\,ms}{360}$$

$$119 = \frac{t_d}{16.67\,ms} \cdot 360$$

$$\boxed{t_d = 5.5\,ms}$$


t=2
v_{out} @ t>2



impedance = Resistance + Reactance

$$Z = \frac{50 \cdot 265.3\angle -90}{50 + 265.3(-j)}$$

$$Z = \frac{13.27k\angle -90}{270\angle -79.3^\circ}$$

$$Z = 49.15\angle -10.7^\circ \rightarrow$$

79.3°

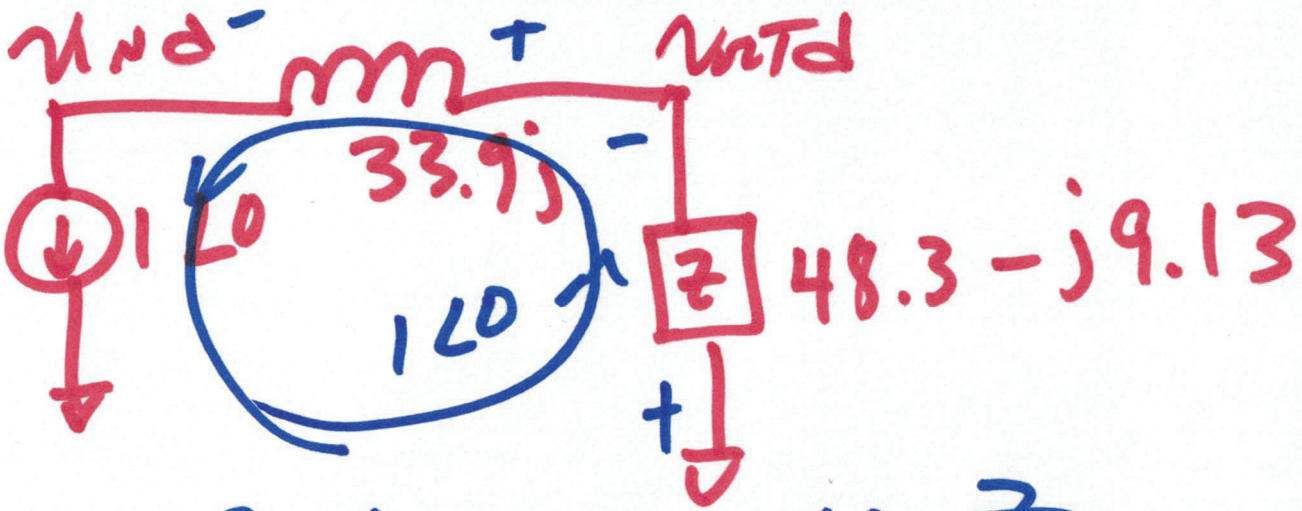
49.15cos(10.7) + j 49.15 Sin(10.7)

$-14.37 + j(-9.13)$

$Z = 49.15 \angle 10.7 + j\ 49.15 \sin(-10.7)$

$49.15 \cos(-10.7)$

$$\boxed{Z = 48.3 - j9.13}$$



$$v_{out_d} = -1\angle 0 \cdot Z$$

$$v_{ind} = -1\angle 0) \cdot Z - 33.9j \cdot 1\angle 0$$