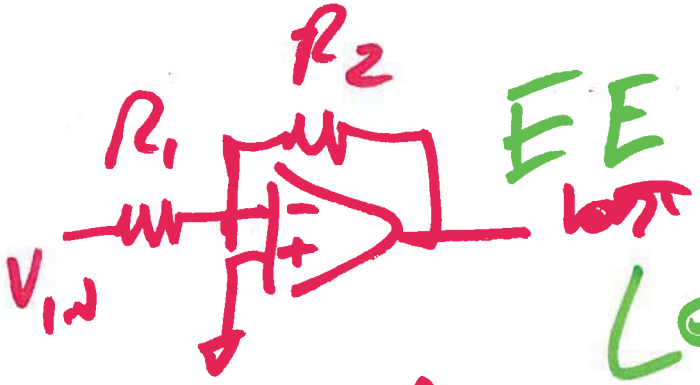
EE 221 Circuits II

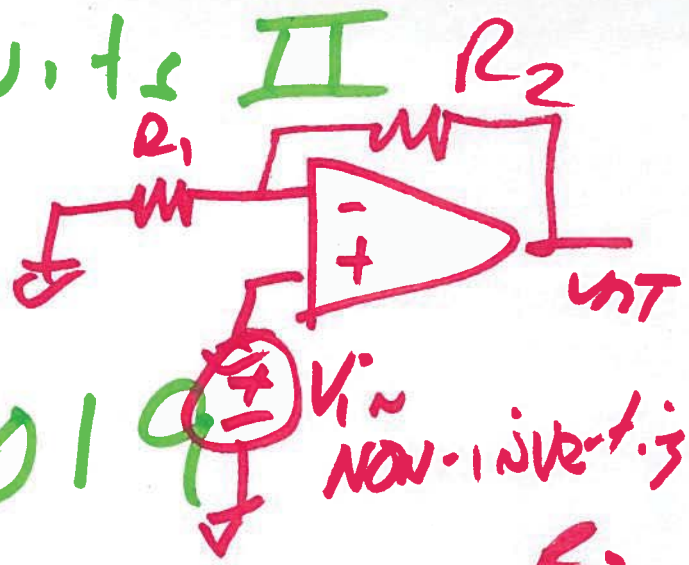
Lecture 6

Feb. 11, 2019

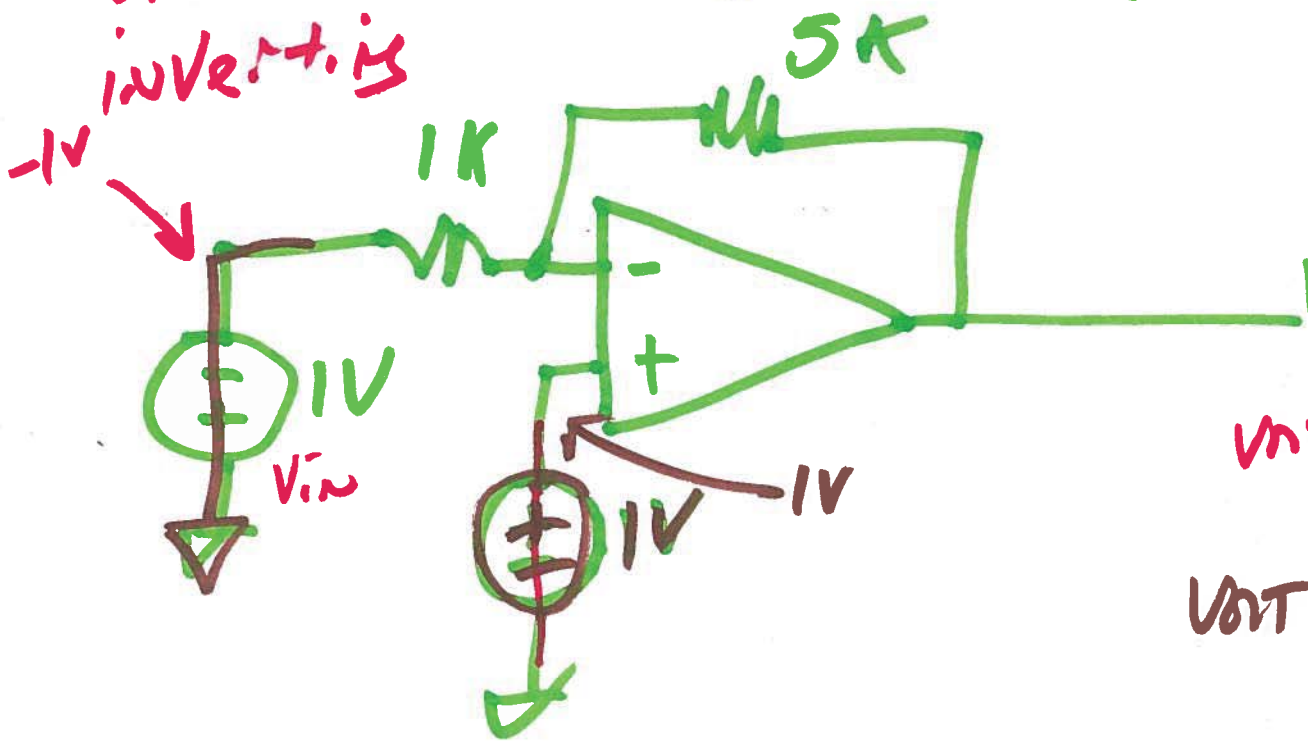


$$\frac{V_{OUT}}{V_{IN}} = -\frac{R_2}{R_1}$$

inverting



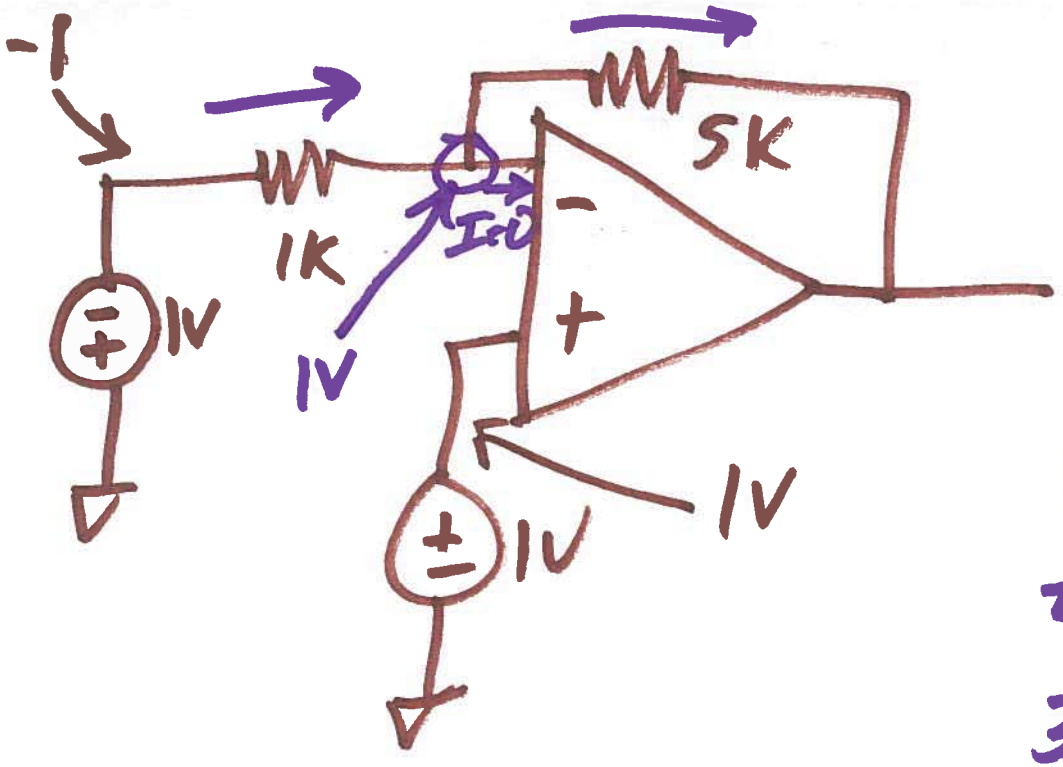
$$\frac{V_{OUT}}{V_{IN}} = 1 + \frac{R_2}{R_1} = \frac{R_1 + R_2}{R_1}$$



$$V_{OUT} = (-1)\left(-\frac{5K}{1K}\right) = +5V$$

$$V_{OUT} = +1\left(1 + \frac{5K}{1K}\right) = +6V$$

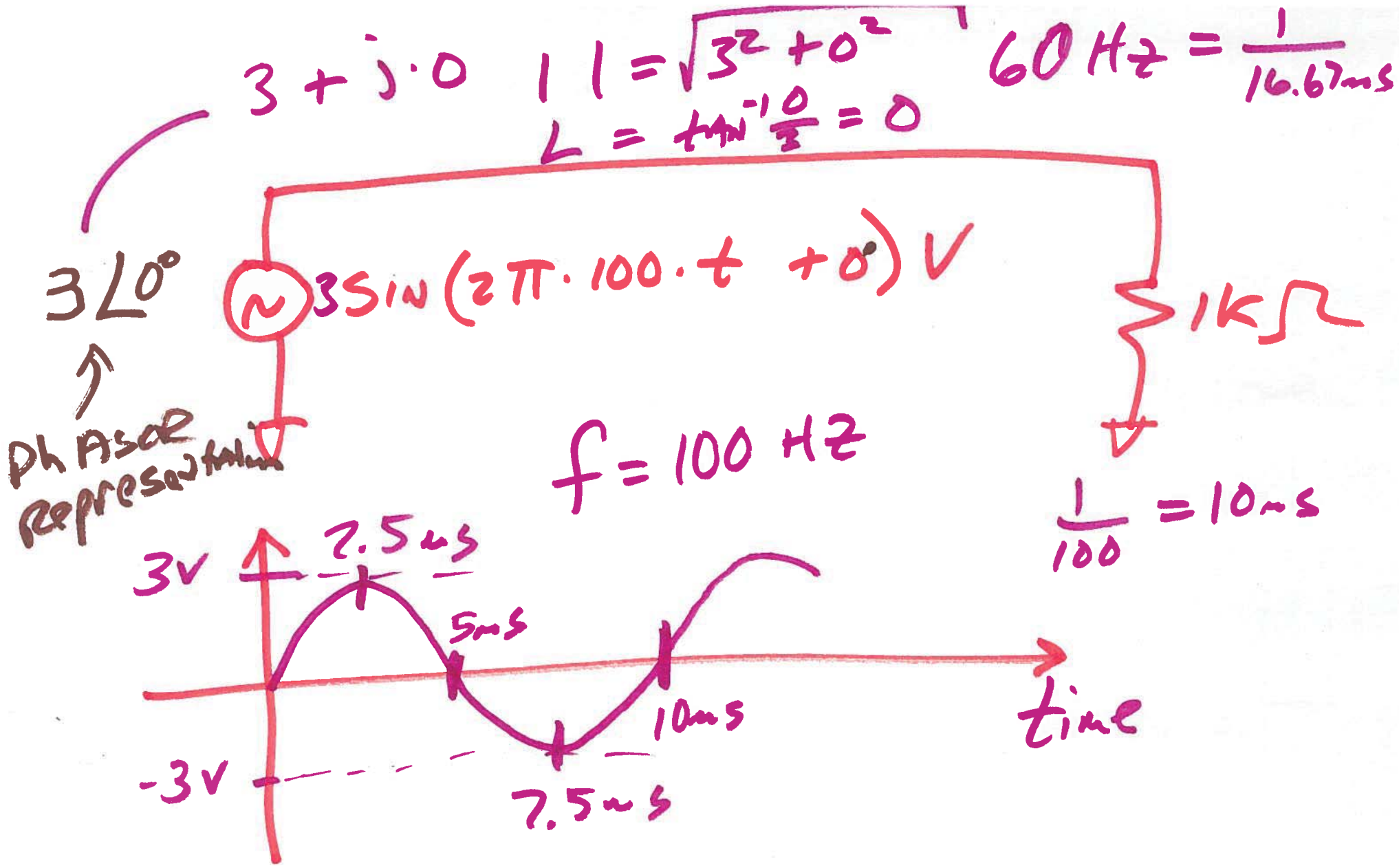
$$V_{OUT\,total} = 11V$$

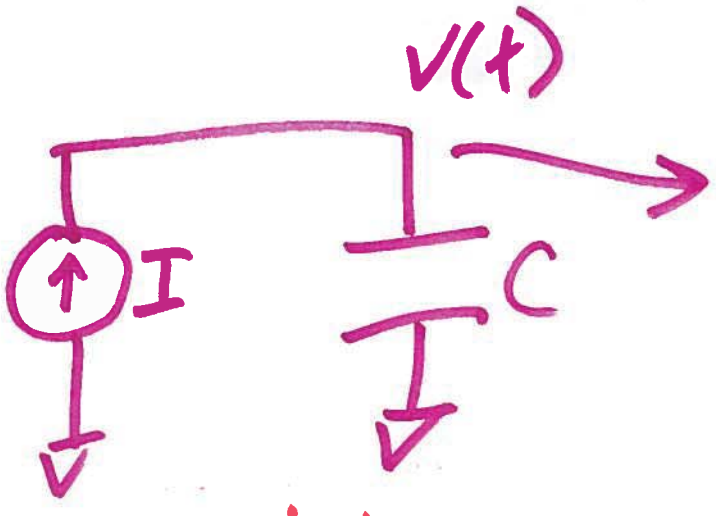


$$\frac{-1-1}{1K} = \frac{1-V_{OUT}}{5K}$$

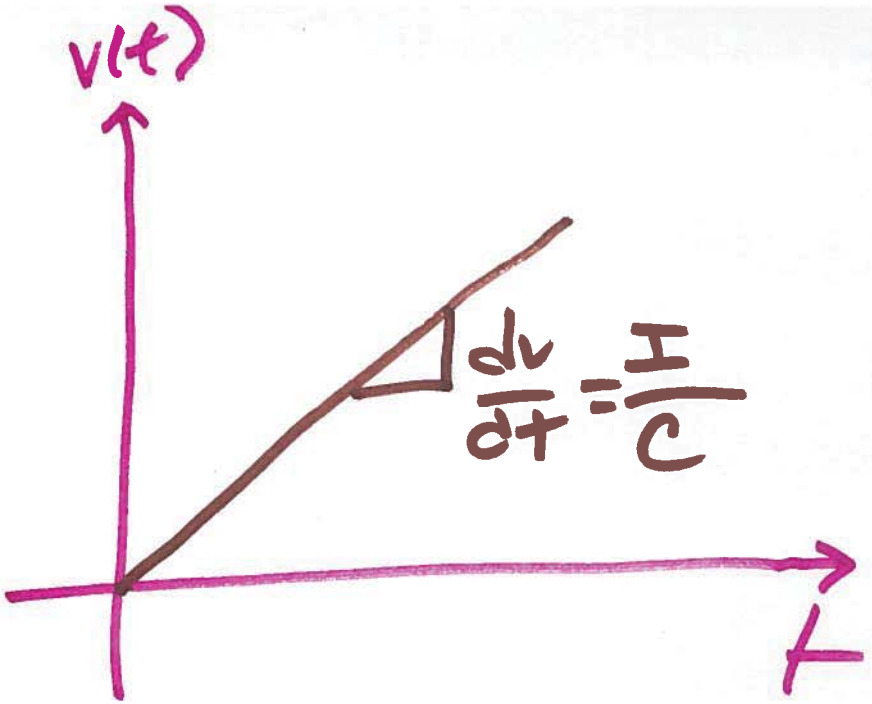
$$-10 = 1 - V_{OUT}$$

$$\boxed{V_{OUT} = 11V}$$

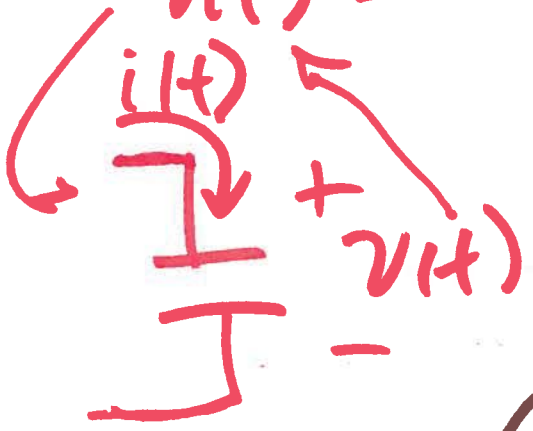

3 + j·0
|| = √(3² + 0²)
∠ = tan⁻¹ 0/3 = 0
60 Hz = 1/16.67ms
3∠0°
Phasor representation
3SIN(2π·100·t + 0°) V
1KΩ
f = 100 Hz
1/100 = 10ms
3V
-3V
2.5ms
5ms
7.5ms
10ms
time



$$I = C\frac{dv}{dt}$$

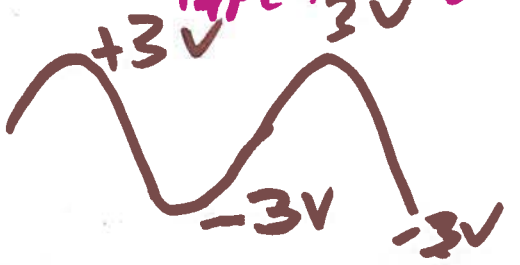


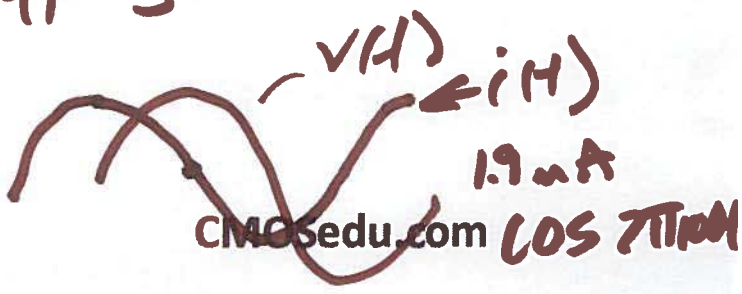
$v(t) = 3\sin(2\pi \cdot 100 \cdot t)$, $C = 1\mu F$

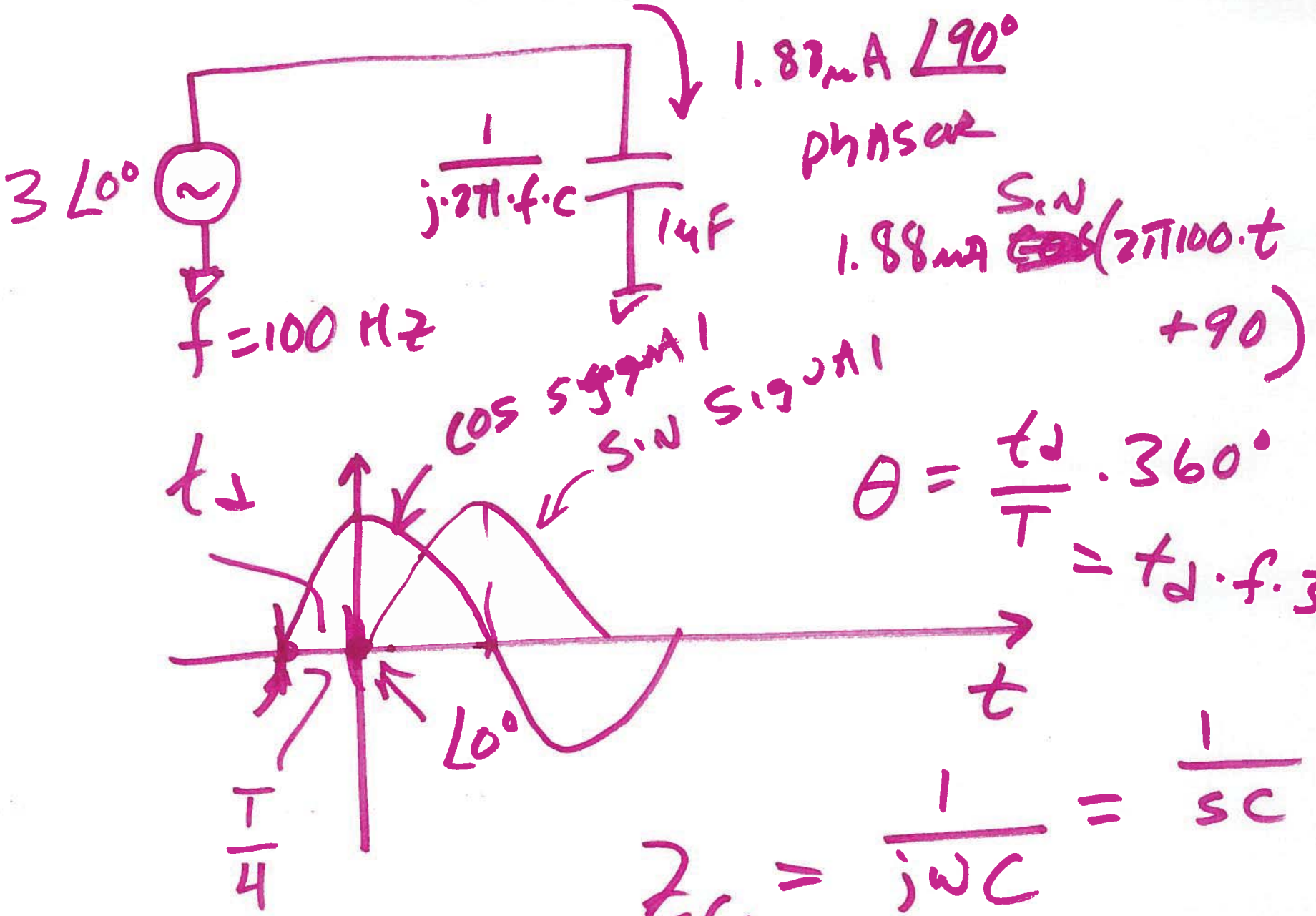


$$i(t) = 1\mu F \cdot \frac{d(3\sin 2\pi \cdot 100 \cdot t)}{dt}$$

$$1\mu F \cdot 3 \cdot 2\pi 100 \cdot \cos 2\pi 100 t$$







$$\theta = \frac{t_d}{T} \cdot 360°$$

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

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

$$s = j\omega$$

$3 \sin 2\pi f \cdot t$

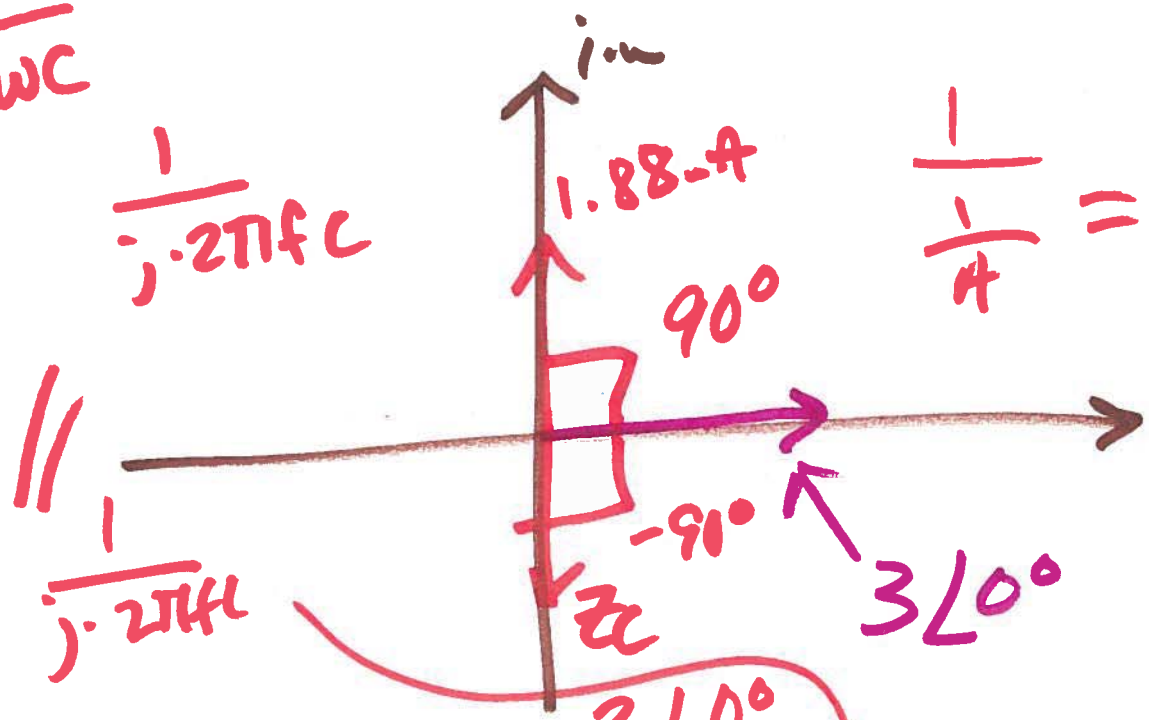
$1.88\,mA \cos 2\pi 100 \cdot t$

$1.88\,mA \angle 90°$

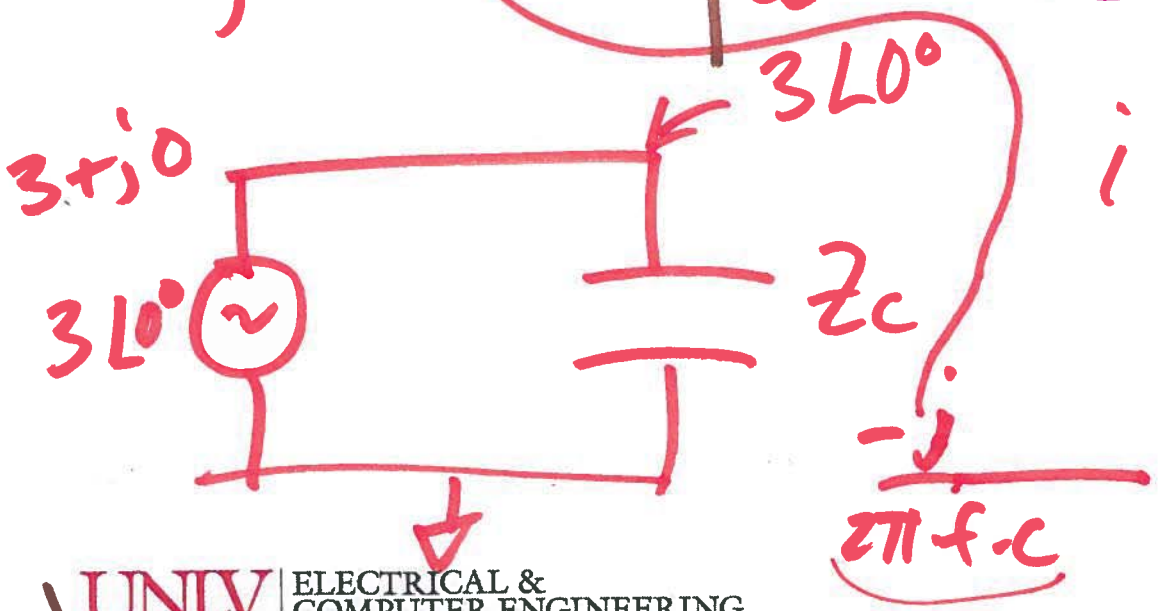
$\frac{1}{j \cdot \omega C}$

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

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



$\frac{1}{\frac{1}{A}} = A \quad \frac{\angle\theta_1}{\angle\theta_2} = \angle\theta_1 - \theta_2$



$i = \frac{3\angle 0°}{Z_c} = 1.88\angle 90° \text{ mA}$

$= \frac{3\angle 0°}{\frac{1}{1.88\text{-mA}}\angle -90}$

$\frac{3}{}$

$$Z_C = \frac{1}{j\omega C} \Rightarrow j\left(-\frac{1}{\omega C}\right) \Rightarrow |1| = \sqrt{0^2 + \left(-\frac{1}{\omega C}\right)^2}$$

$$\angle \tan^{-1} \frac{-\frac{1}{\omega C}}{0} = -90°$$

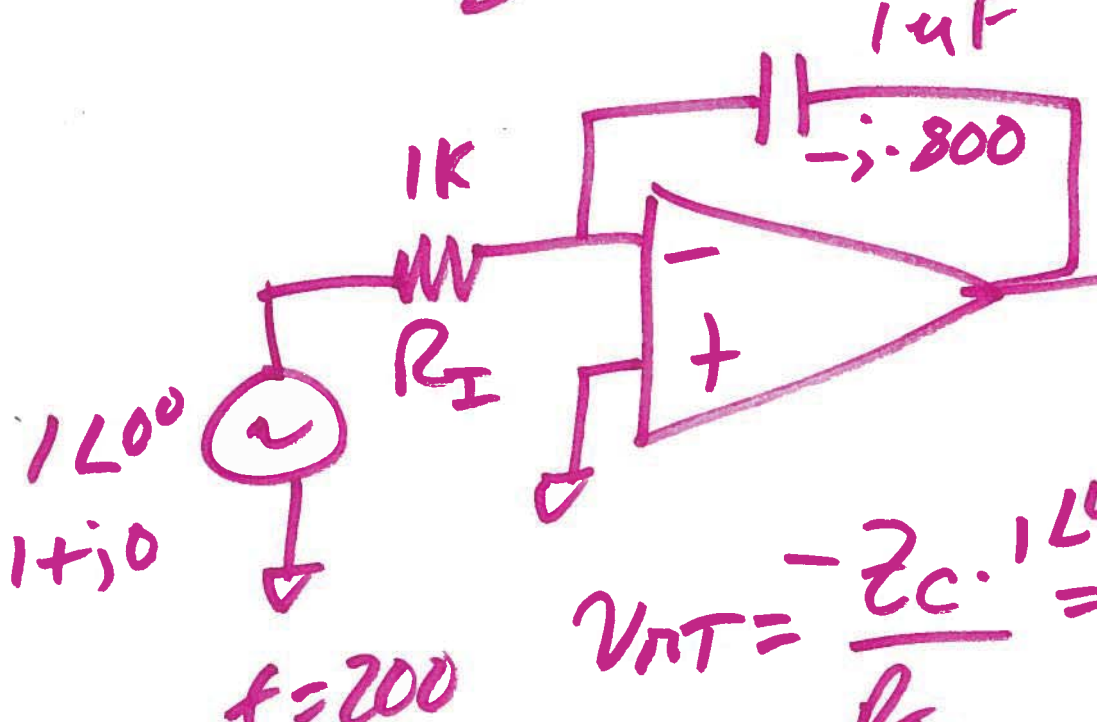
$$|Z_C| = \frac{1}{\omega C}$$

$$\frac{1}{j} \cdot \frac{j}{j} = \frac{j}{j \cdot j}$$

$$\angle Z_C = \angle -90°$$

$$-1$$

$$= -j$$



$$Z_C = \frac{1}{j2\pi \cdot 1\mu F \cdot 200}$$

$$V_{out} = \frac{-Z_C \cdot 1\angle 0°}{R_I} = \frac{-(-j800)}{1K\,V} \cdot 1\angle 0° = \frac{10^6}{1330}$$

$$= -j800\,\Omega$$

$$= 0.8\,\text{k}\Omega \cdot j = 0.8\,V\angle 90°$$

7)