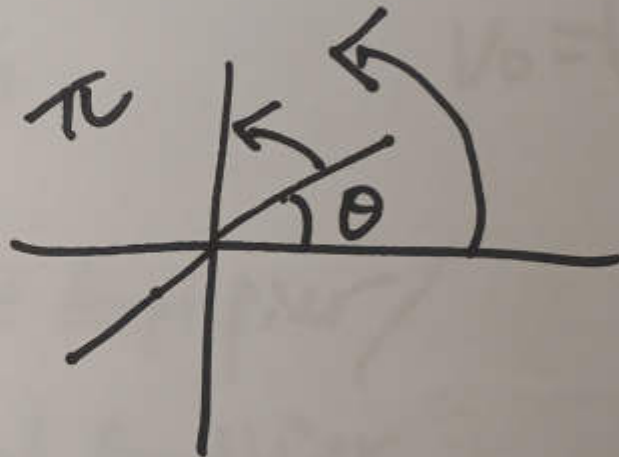
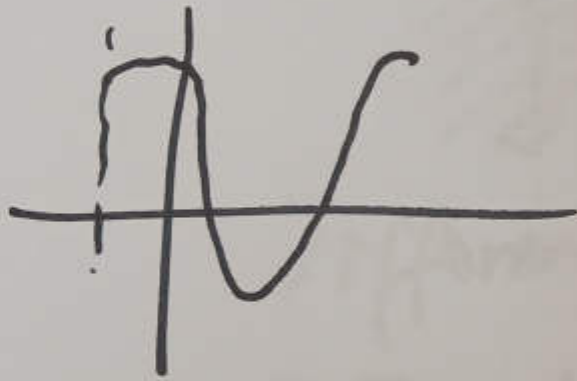


~~minus right lagging~~

Plus left (leading)



$\cos(\omega t + \theta)$



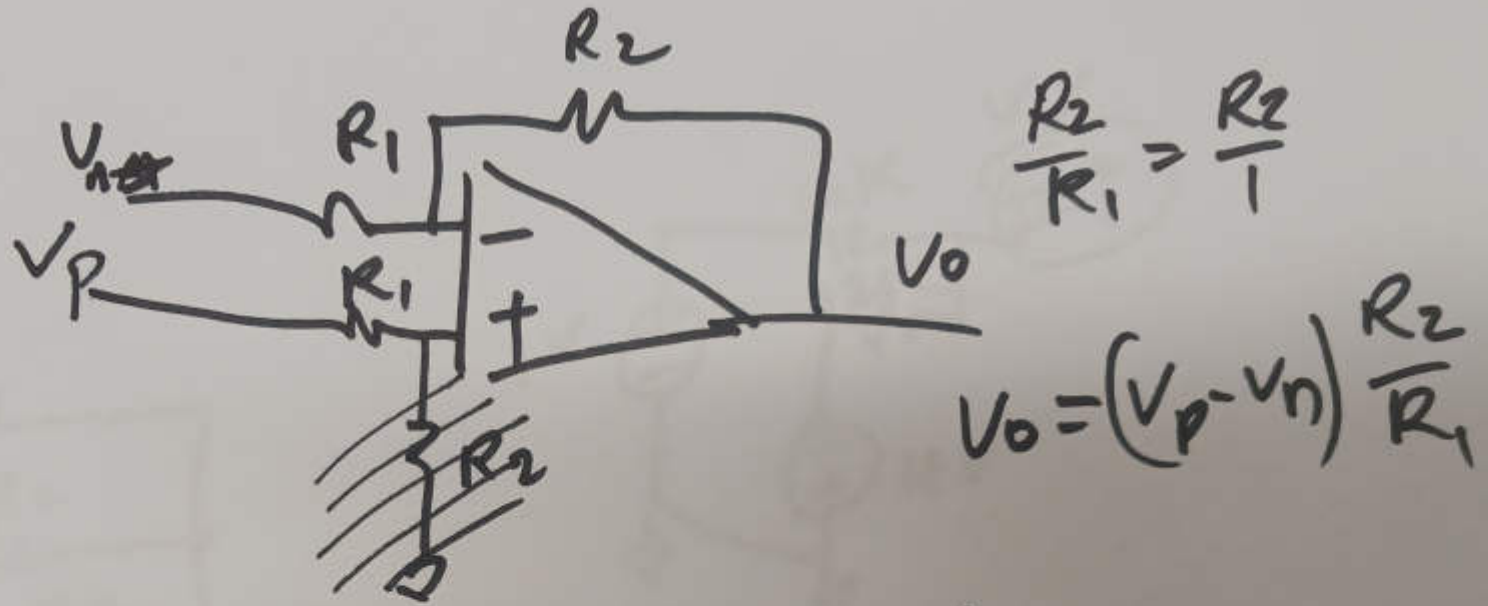
$$\frac{1}{\frac{1}{L_3} + \frac{1}{L_4}}$$

$$L_1 + L_2$$

$$\frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

$$C_3 + C_4$$

①

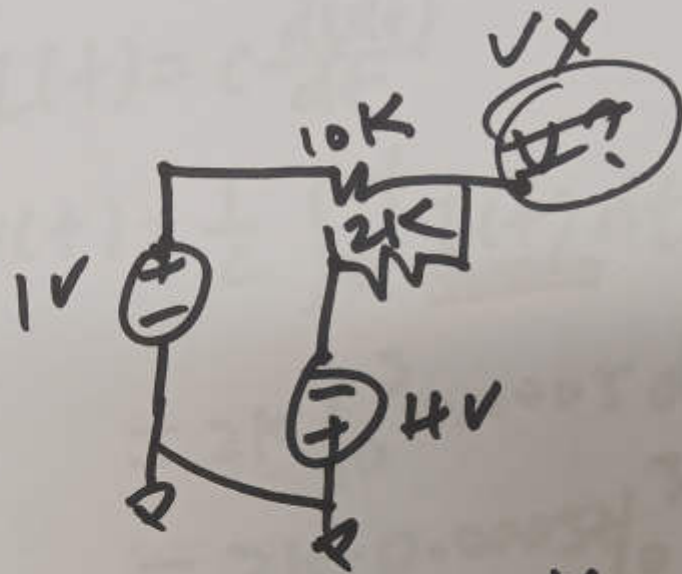
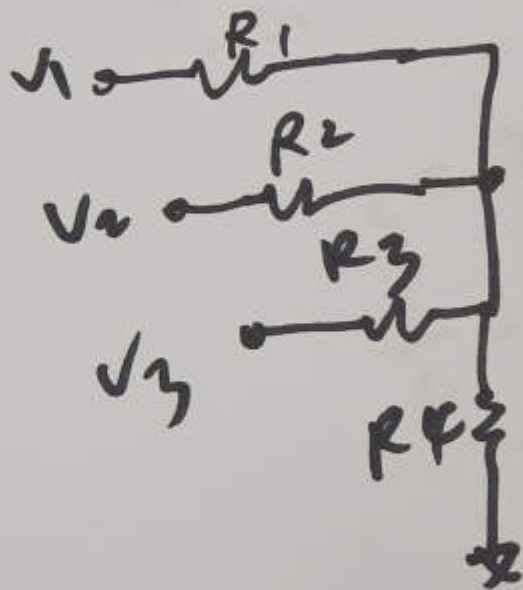


$$\frac{R_2}{R_1} = \frac{R_2}{R_1}$$

$$V_o = (V_p - V_n) \frac{R_2}{R_1}$$

Difference Amplifier /
Differential Amplifier

(2)



$$\frac{0 - V_x}{10K} = \frac{V_x - 0}{40K}$$

$$\frac{-1}{5} = -0.2$$

$$I(t) = C \frac{dV(t)}{dt}$$

$$1 \times 500 \mu F = 500 \mu A$$

$$-0.2 \times 500 \mu F = -100 \mu A$$

3

$$0.5 \mu\text{A} \\ = 0.0005 \text{A}$$

$$C = 500 \mu\text{F} \\ \frac{1}{C} = \frac{1}{500 \cdot 10^{-6}} \\ = 0.2 \cdot 10^4 \\ = 2 \text{K}$$

$$I(t) = C \frac{dU(t)}{dt}$$

$$U(t) = \frac{1}{C} \int_0^t \underline{I(t)} dt + \underline{U_C(0)}$$

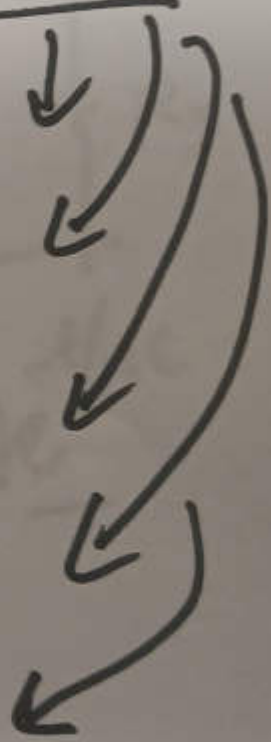
$$= 2 \text{K} \int_0^3 0.0005 dt$$

$$= 2 \text{K} \cdot 0.0005 t \Big|_0^3$$

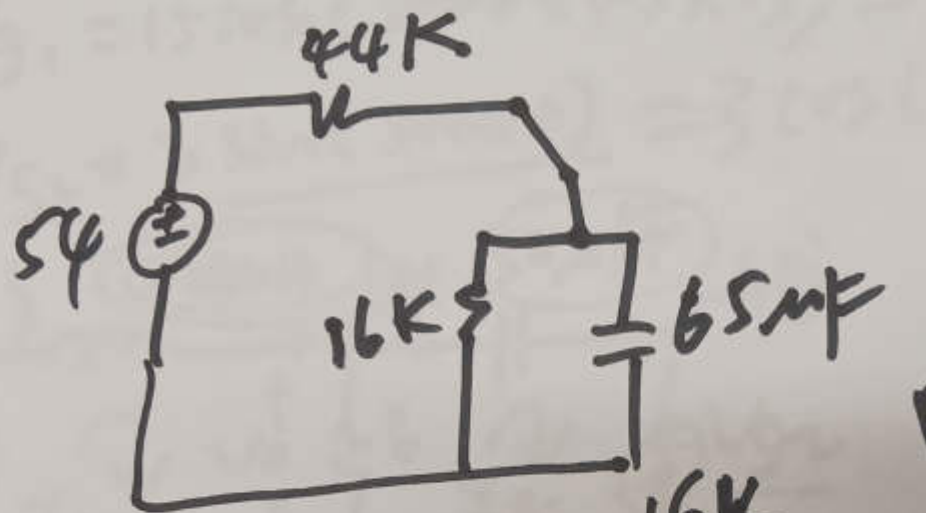
$$= 2 \text{K} \cdot 3 \cdot 0.0005$$

$$= 6 \text{K} \cdot 0.0005$$

$$= 3 \text{V}$$



④



$$V_c(0) = 54 \cdot \frac{16k}{44k + 16k}$$

$$V_c(t) =$$

$t > 0$

$$V_c(0^+) = V_c(0^-)$$

$$R_{TH} = \frac{R_2 || R_3}{}$$

$$\tau = RC = R_{TH} \cdot 65\mu F$$



$$V(t) = V_c(0) e^{-t/\tau}$$

$t > 0$

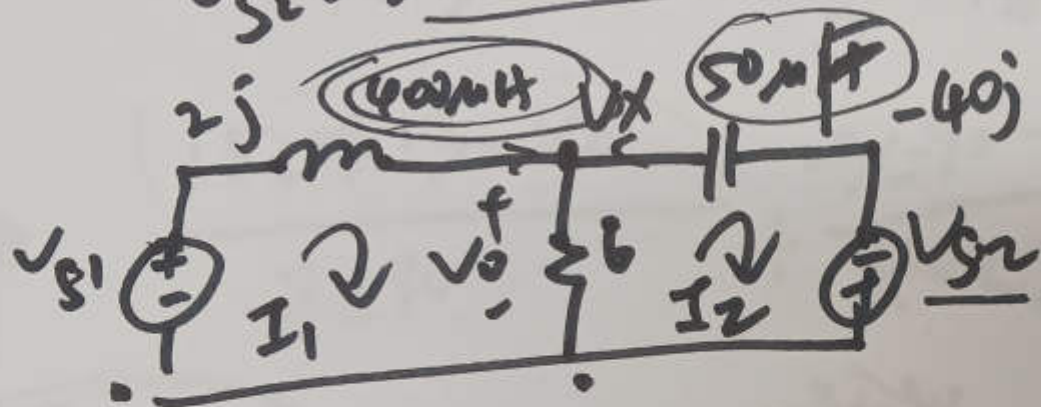
$$\tau = \frac{L}{R}$$

$$I_c(t) = I_c(0) \cdot e^{-t/\tau}$$

5

$$v_{g1} = 15 \cos(5000t + 3) = 15 \angle 3^{\circ}$$

$$v_{g2} = 3 \sin(5000t) = 3 \cos(5000t - 90) = 3 \angle -90$$



$$j\omega L = j \cdot 5000 \cdot 400 \cdot 10^{-4}$$

$$= 2j$$

$$\frac{1}{j\omega C} = \frac{-j}{\omega C} = \frac{-j}{5000 \cdot 50 \cdot 10^{-6}}$$

$$= 0.4 \cdot 10^2 \cdot (-j)$$

$$= -40j$$

$$\frac{v_{g1} - v_x}{2j} + \frac{-3 \angle -90 - v_x}{-40j} = \frac{v_x}{6}$$

$$\left\{ \begin{aligned} -15 \angle 3.13 + I_1 \cdot 2j + (I_1 - I_2) \cdot 6 &= 0 \\ (I_2 - I_1) \cdot 6 + I_2 \cdot (-40j) - 3 \angle -90 &= 0 \end{aligned} \right.$$

(6)

$$\frac{15253.13 - V_x}{0 + 2j} + \frac{-36 - 90 - V_x}{0 - 40j} = \frac{V_x}{6}$$

$$\frac{15253.13 - V_x}{2690} + \frac{-36 - 90 - V_x}{40 \angle -90} = \frac{V_x}{6}$$

$152 \angle 0^\circ$

$$\frac{15253.13}{2690}$$

$$- \frac{V_x}{2690} + \frac{-36 - 90}{40 \angle -90} - \frac{V_x}{40 \angle -90} = \frac{V_x}{6}$$

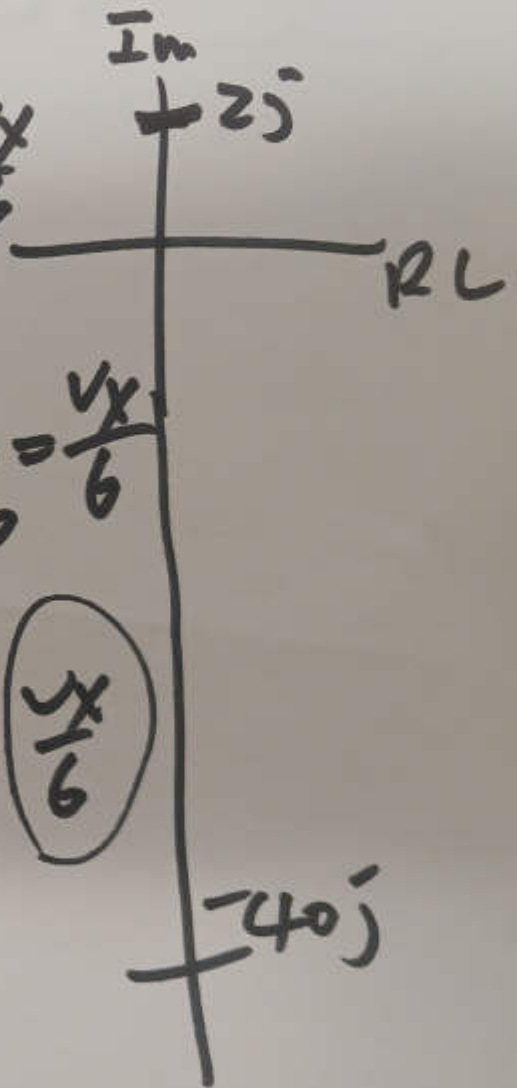
$7.8 \angle -36.87^\circ$

$$- \frac{V_x}{2690} - \frac{3}{40} - \frac{V_x}{40 \angle -90} = \frac{V_x}{6}$$

3245
 $+ 5250$

$$V_x =$$

⑦



$$= 3e^{j45} + 5e^{j50}$$

$$= 3(\cos 45 + j \sin 45) + 5(\cos 50 + j \sin 50)$$

$$= a + bj$$

$$\Rightarrow \sqrt{a^2 + b^2} e^{j \arctan \frac{b}{a}}$$

$$= \sqrt{a^2 + b^2} \angle \arctan \frac{b}{a}$$

(8)