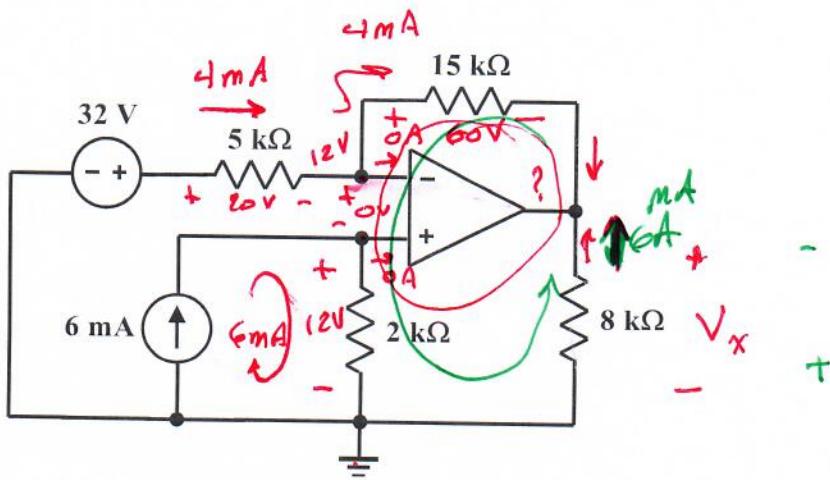


EE/EET 2240  
Homework Problem #036



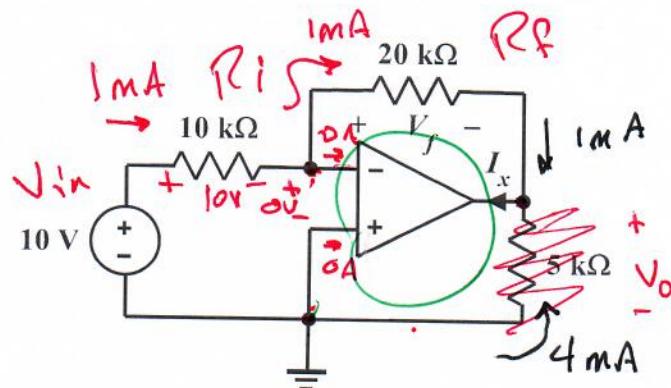
The OpAmp is ideal. Determine the amount of power absorbed by the  $8\text{k}\Omega$  resistor.

$$-60\text{V} + 0\text{V} + 12\text{V} = V_x$$

$$V_x \approx -48\text{V}$$

$$(6\text{mA})(48\text{V}) = 288\text{mW}$$

EE/EET 2240  
Homework Problem #035



$$V_o = \underline{\left( -\frac{R_f}{R_i} \right)} V_{in}$$

gain

The OpAmp is ideal. Determine:

- (a) The value of  $V_f$ .

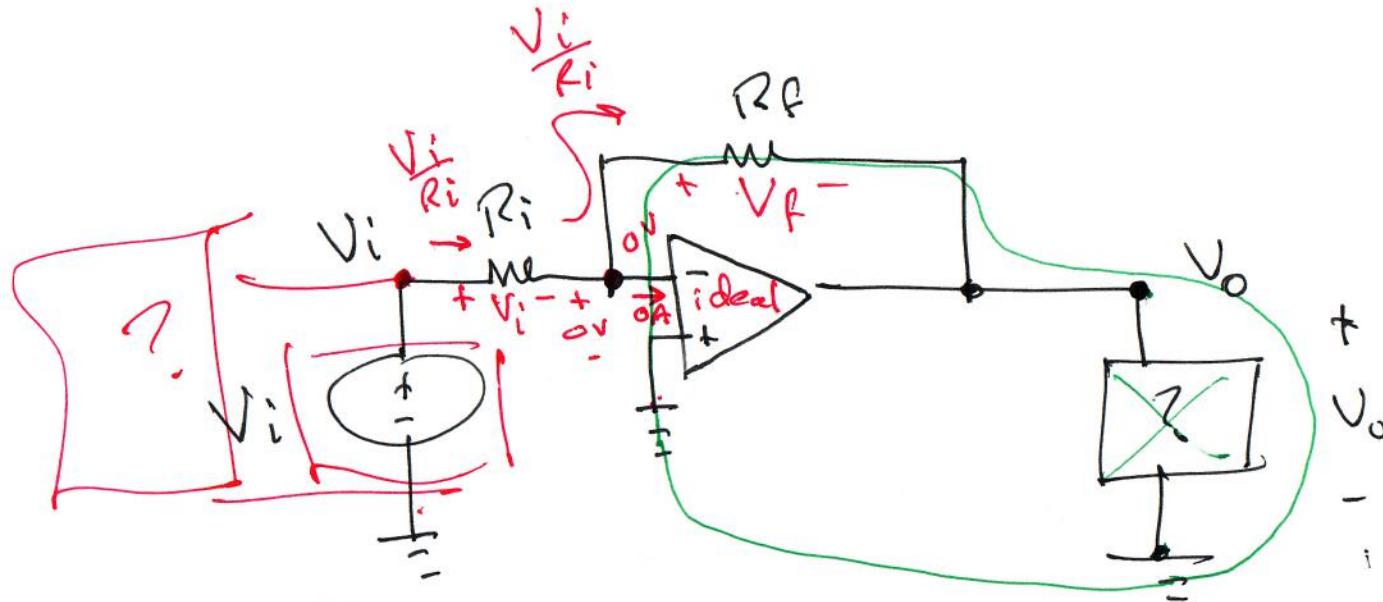
$$V_f = -V_o$$

$$-0 + V_f + V_o = 0 \Rightarrow V_f = -V_o$$

- (b) The value of  $I_x$ .

$$V_f = \underline{20 \text{ V}}$$

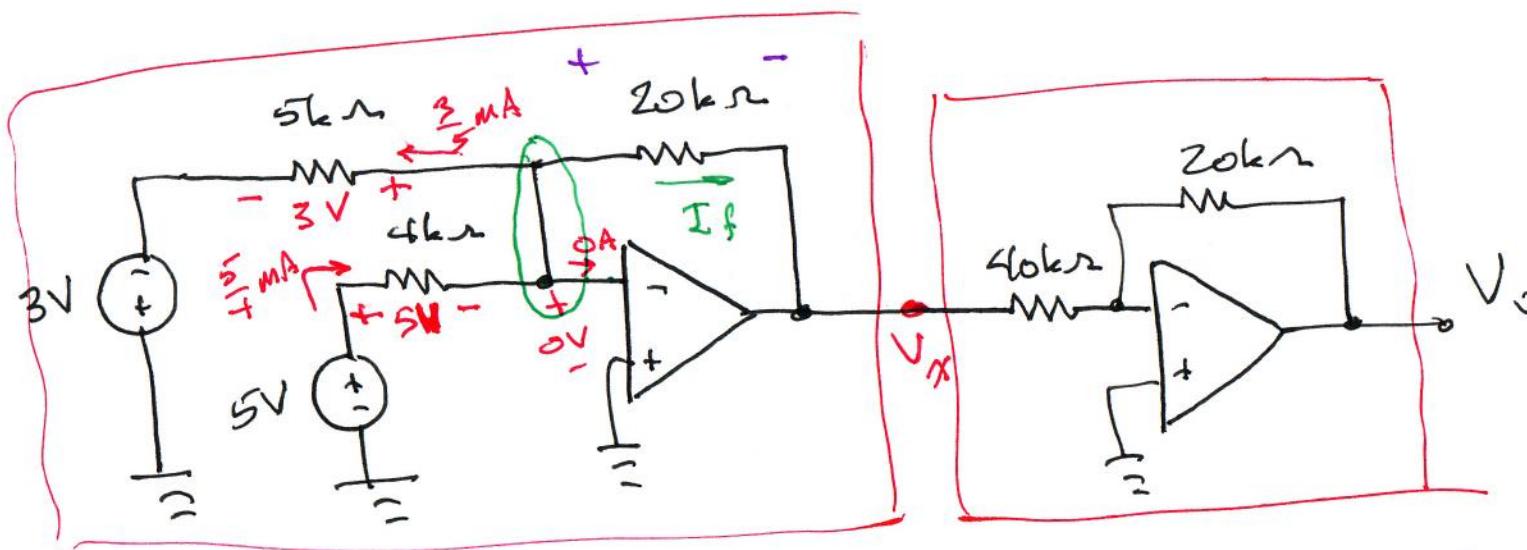
$$I_x = 4 \text{ mA} + 1 \text{ mA} = 5 \text{ mA}$$



$$V_f = \frac{R_f}{R_i} V_i = \frac{R_f}{R_i} V_i$$

$$-V_o - V_f + 0 = 0$$

$$V_o = -V_f$$



$$1,25 \text{ mA} - 0,6 \text{ mA} = I_f$$

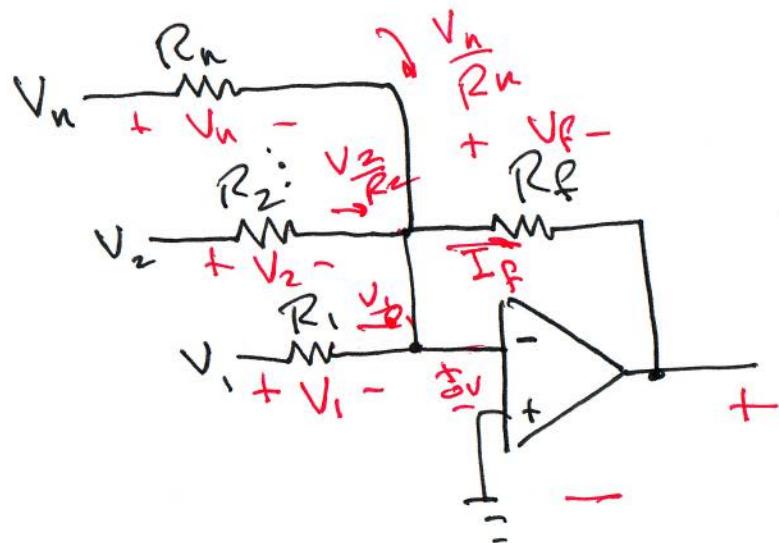
$$I_f = \frac{13}{20} \text{ mA} = 0,65 \text{ mA}$$

$$V_0 = - \frac{20 \text{ k}\Omega}{40 \text{ k}\Omega} \cdot V_x$$

$$= -\frac{1}{2} V_x$$

$$V_x = -13 \text{ V}$$

$$V_0 = -\frac{1}{2} (-13) = 6.5 \text{ V}$$



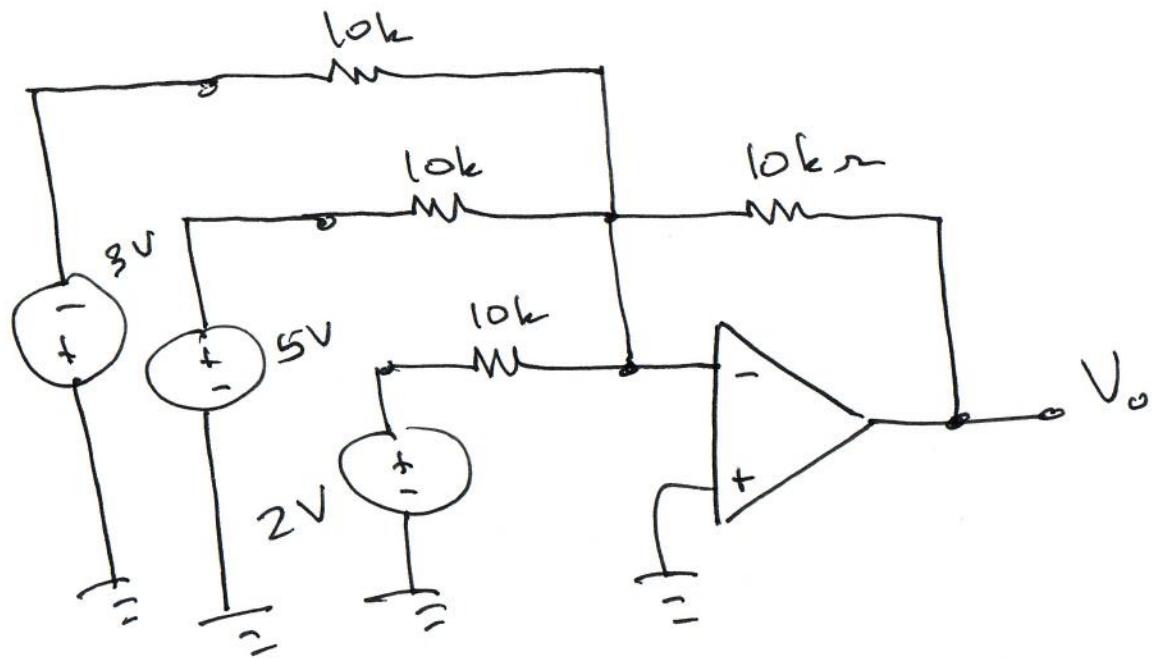
$$V_o = -\frac{R_f}{R_1} V_1 - \frac{R_f}{R_2} V_2 - \dots - \frac{R_f}{R_n} V_n$$

$$I_f = \frac{V_1}{R_1} + \frac{V_2}{R_2} + \dots + \frac{V_n}{R_n}$$

$$V_f = R_f I_f = \frac{R_f}{R_1} V_1 + \frac{R_f}{R_2} V_2 + \dots + \frac{R_f}{R_n} V_n$$

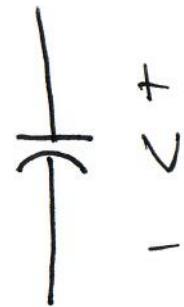
$$V_o = -V_f = -\frac{R_f}{R_1} V_1 - \frac{R_f}{R_2} V_2 - \dots - \frac{R_f}{R_n} V_n$$

Summing Amplifier



$$\begin{aligned}
 V_o &= -1(2) - 1(5) - 1(-3) \\
 &= -4 \text{ V}
 \end{aligned}$$

# Capacitor (Condensers)



$$v = \frac{+}{-} C \quad \text{farad, F}$$

A hand-drawn diagram of a capacitor symbol with a current arrow labeled 'i' flowing downwards through the gap. Below the symbol, the equation  $v = \frac{+}{-} C$  is written, where 'v' is above the symbol and 'C' is below it. To the right of the symbol, the word 'farad, F' is written.

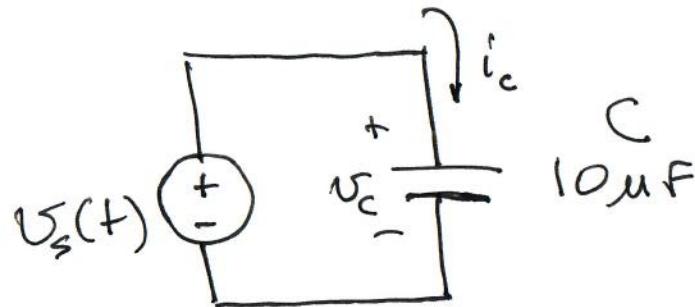
If defined to satisfy  
the PSC, then

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

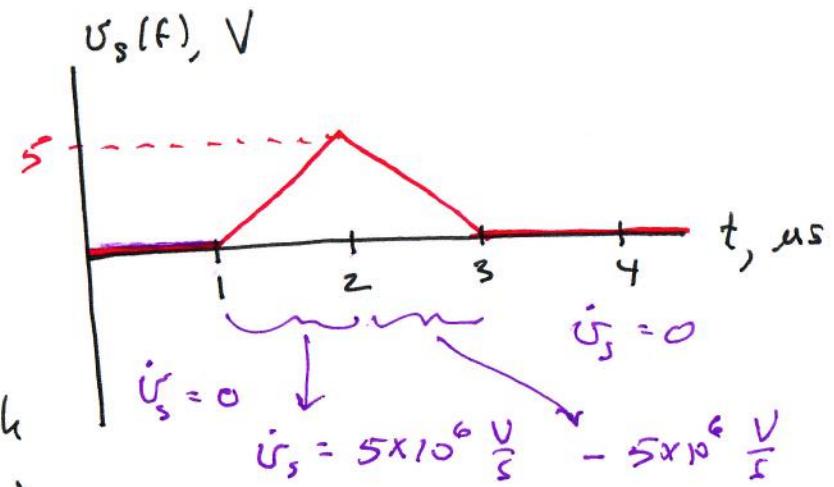
or

$$\begin{aligned} v(t) &= \frac{1}{C} \int_{-\infty}^t i dt \\ &= \frac{1}{C} \int_{-\infty}^0 i dr + \frac{1}{C} \int_0^t i dr \\ &= v(0) + \frac{1}{C} \int_0^t i dr \end{aligned}$$

A series of equations showing the derivation of the capacitor voltage. It starts with  $v(t) = \frac{1}{C} \int_{-\infty}^t i dt$ , then separates the integral into two parts:  $\int_{-\infty}^0 i dr$  and  $\int_0^t i dr$ . The first part is crossed out with a large 'X'. The second part is evaluated from 0 to  $t$ . Finally, the initial voltage  $v(0)$  is added to the result, resulting in  $v(t) = v(0) + \frac{1}{C} \int_0^t i dr$ .



Determine and sketch  
the capacitor current,  $i_c$ .



$$\underline{i_c} = \underline{C \dot{U}_s} = \underline{C \dot{U}_s} = (\underline{10 \times 10^{-6}}) \dot{U}_s$$

