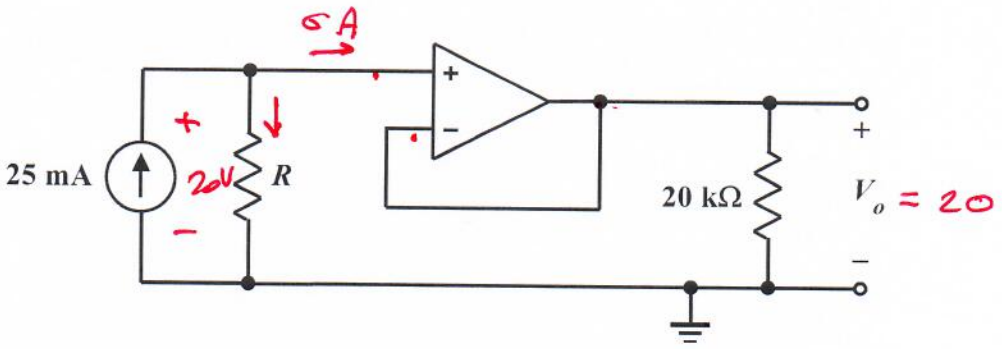
EE/EET 2240

Homework Problem #039

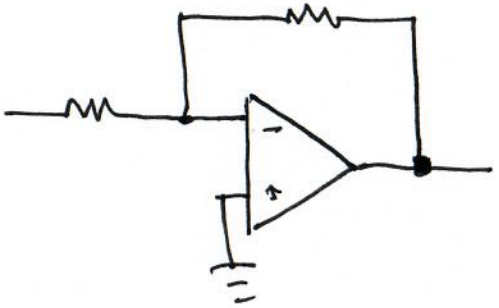


The OpAmp is ideal. Determine the value of R required to make $V_o = 20\,\text{V}$.

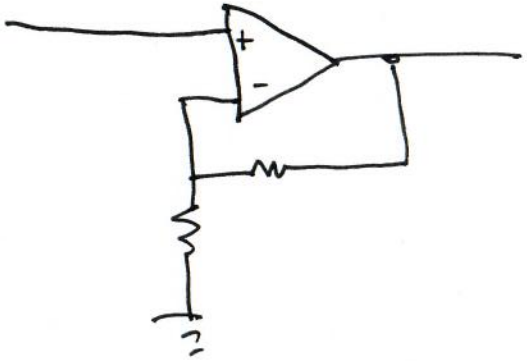
$R(25\,mA) = 20\,V$

$R = \frac{20}{25}\,k\Omega$

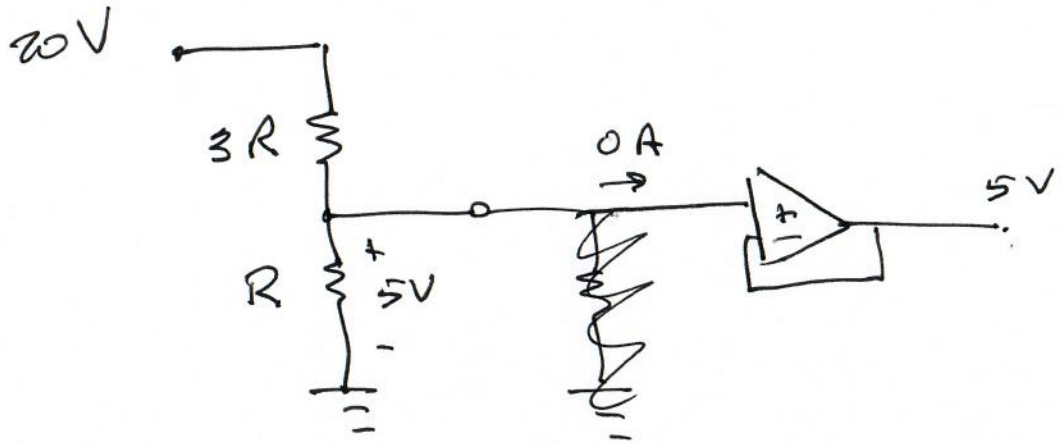
$= 800\,\Omega$



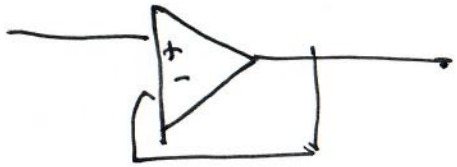
Inverting Amplifier



Non-Inverting Amplifier



Buffer or Voltage Follower



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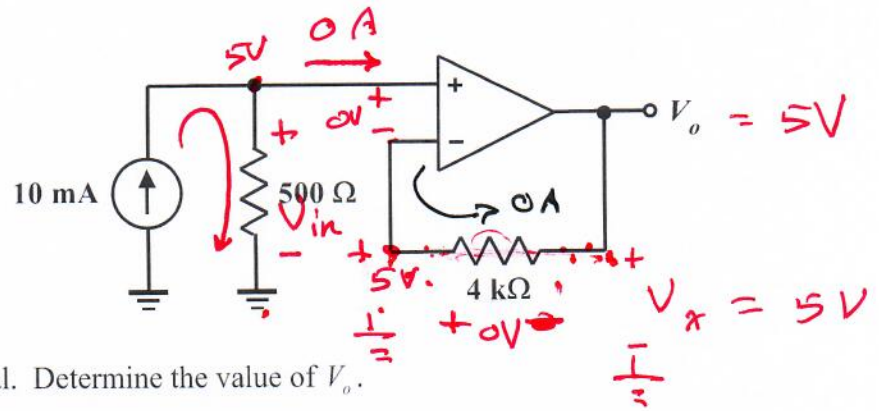
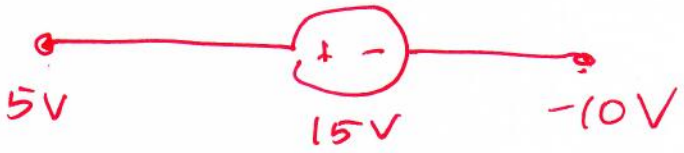
Homework Problem #038



The OpAmp is ideal. Determine the value of V_o.

$$V_{in} = (10mA)(500\Omega) = 5V$$



Exam #2

Next Thursday, 10/25

9:30 AM - 10:45 AM

LIBR 3A in Pocatello

TAB 115 in IF

2. Mesh Analysis

* 4. Linearity / Superposition w/o Controlled Sources

F.E. [Thévenin / Norton / ST / Max. Power

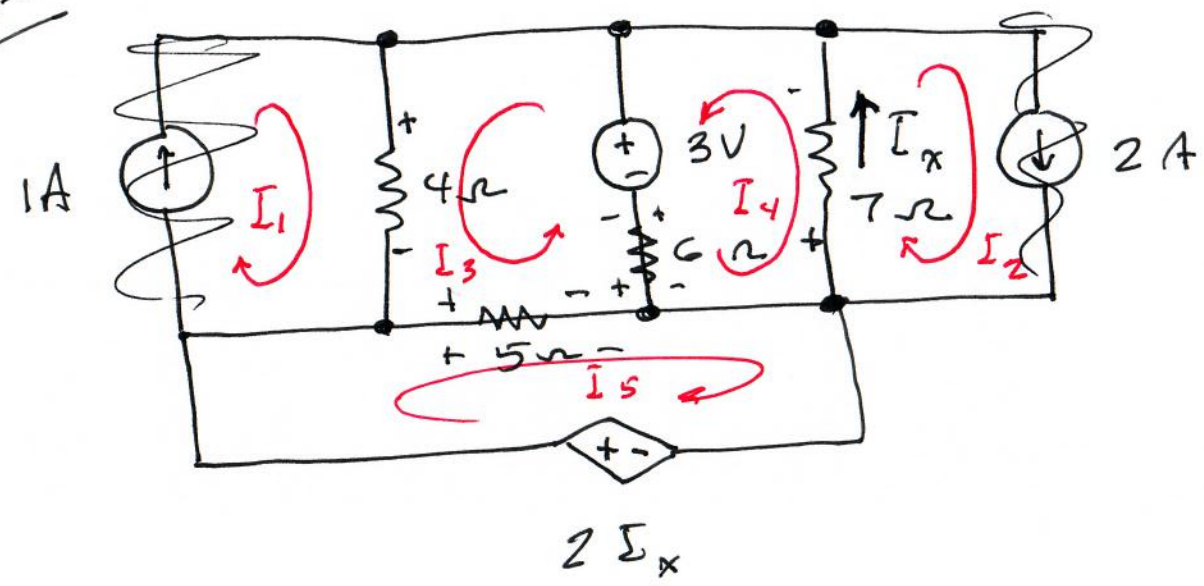
Controlled (or Dependent) Sources

* 3. Op. Amps

1. Matrix Equation to Solve

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 3 \\ 2 & 1 & 7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 3 \end{bmatrix}$$

Mesh Analysis



$I_1 = 1$ (constraint)

$I_2 = 2$ (constraint)

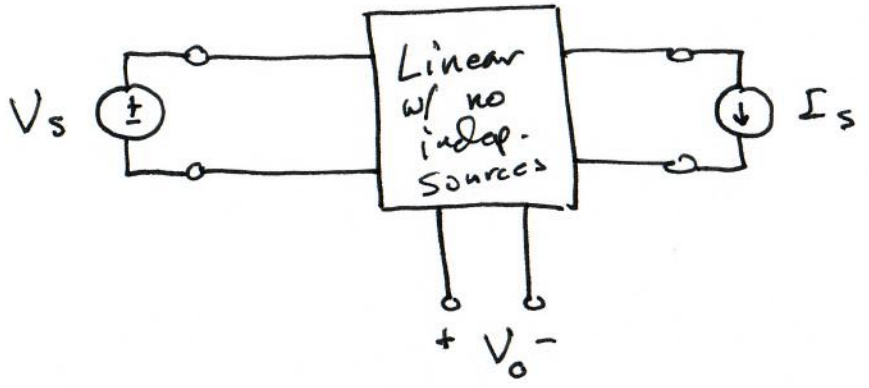
$4(I_1 + I_3) + 5(I_3 + I_5) + 6(I_3 - I_4) - 3 = 0$ (KVL for mesh 3)

$+3 + 6(I_4 - I_3) + 7(I_2 + I_4) = 0$ (KVL for mesh 4)

$(I_3 + I_5) - 2I_x = 0$ (KVL for mesh 5)

$I_x = I_2 + I_4$ (definition)

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 4 & 6 & 15 & -6 & 5 & 0 \\ 0 & 7 & -6 & 13 & 0 & 0 \\ 0 & 0 & 5 & 0 & 5 & -2 \\ 0 & -1 & 0 & -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \\ I_5 \\ I_x \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ -3 \\ 0 \\ 0 \end{bmatrix}$$



For $V_s = 2V$ and $I_s = 5A$, $V_o = 10V$

For $V_s = 5V$ and $I_s = 6A$, $V_o = 15V$

For $V_s = 3V$ and $I_s = 4A$, $V_o = ?$

Assume $V_o = K_1 V_s + K_2 I_s$

$$2K_1 + 5K_2 = 10$$
$$5K_1 + 6K_2 = 15$$

$$\begin{bmatrix} 2 & 5 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} K_1 \\ K_2 \end{bmatrix} = \begin{bmatrix} 10 \\ 15 \end{bmatrix}$$

Solve for $K_1 = \frac{15}{13}$

$$K_2 = \frac{20}{13}$$

$$V_o = \frac{15}{13} V_s + \frac{20}{13} I_s$$

$$V_o = \frac{15}{13}(3) + \frac{20}{13}(4) = \frac{125}{13} V$$