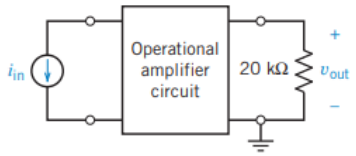
Introduction to Measurements Systems - Tarea 4

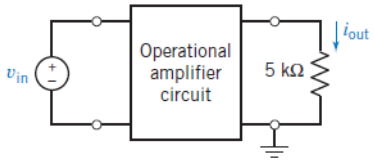
LA-CoNGA physics

February 18, 2023

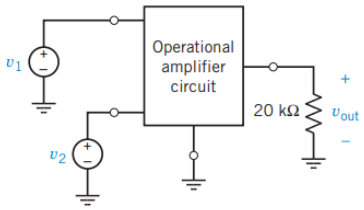
1. Design the operational amplifier circuit in figure so that: $v_{out} = r \cdot i_{in}$, where $r = 20V/mA$



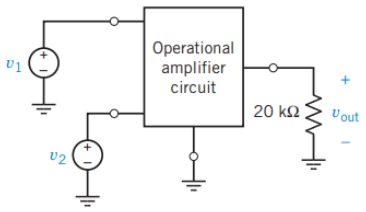
2. Design the operational amplifier circuit in figure so that: $i_{out} = g \cdot v_{in}$, where $g = 2mA/V$



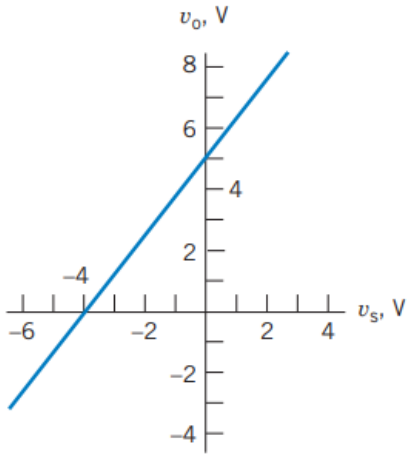
3. Design the operational amplifier circuit in figure so that: $v_{out} = 5 \cdot v_1 + 2 \cdot v_2$



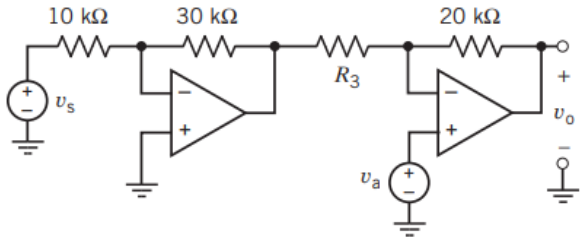
4. Design the operational amplifier circuit in figure so that: $v_{out} = 5 \cdot (v_1 - 2v_2)$



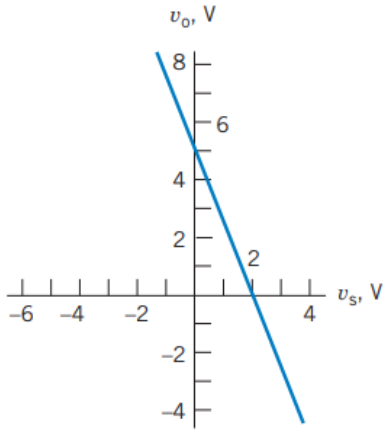
5. Design the circuit so that its input and output have the relationship specified by the graph shown, v_o is the output and v_s is the input



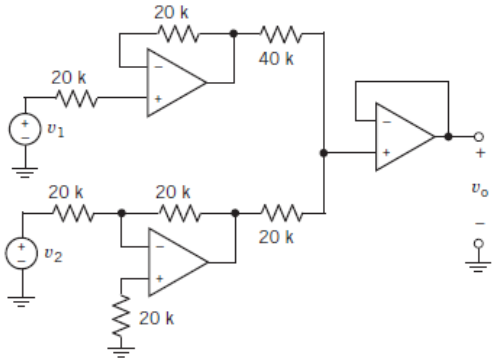
6. Specify values of R_3 and v_a that cause the output to be related to the input by the equation $v_o = 4 \cdot v_s + 7$



7. Design the circuit so that its input and output have the relationship specified by the graph shown, v_o is the output and v_s is the input



8. Find out the relationship between v_o and v_1 and v_2, the calculate the output for $v_1 = 80\mu V$ y $v_2 = 60\mu V$

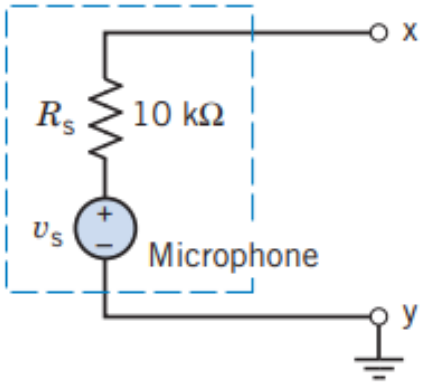


9. Design a circuit having three inputs, v_1, v_2, v_3, and two outputs, v_a, v_b, that are related by the equation

$$\begin{bmatrix} v_a \\ v_b \end{bmatrix} = \begin{bmatrix} 12 & 3 & -2 \\ 8 & -6 & 0 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} + \begin{bmatrix} 2 \\ -4 \end{bmatrix}$$

Hint: A constant input is required. Assume that a 5-V source is available.

10. A microphone has an unloaded voltage $v_s = 20mV$, as shown in figure. It is desired to provide an output voltage of 4 V. Design an inverting circuit and a non-inverting circuit and contrast the input resistance at terminals x–y seen by the microphone. Which configuration would you recommend to achieve good performance in spite of changes in the microphone resistance R_s?



Hint: We plan to connect terminal a to terminal x and terminal b to terminal y or vice versa.