

# APLICACIONES LINEALES DE AMPLIFICADORES OPERACIONALES

The logo for Cartagena99 features the text 'Cartagena99' in a stylized, teal-colored font. The '99' is significantly larger and more prominent than the 'Cartagena' part. The text is set against a light blue background with a white swoosh underneath, all contained within a yellow-bordered box.

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## Amplificador operacional ideal: aplicaciones lineales

- Amplificador de tensión
- Seguidor de tensión
- Sumador
- Amplificador diferencial
- Amplificador de instrumentación
- Conversor corriente-tensión (transimpedancia)
- Conversor tensión-corriente (transadmitancia)
- Integrador ideal/real

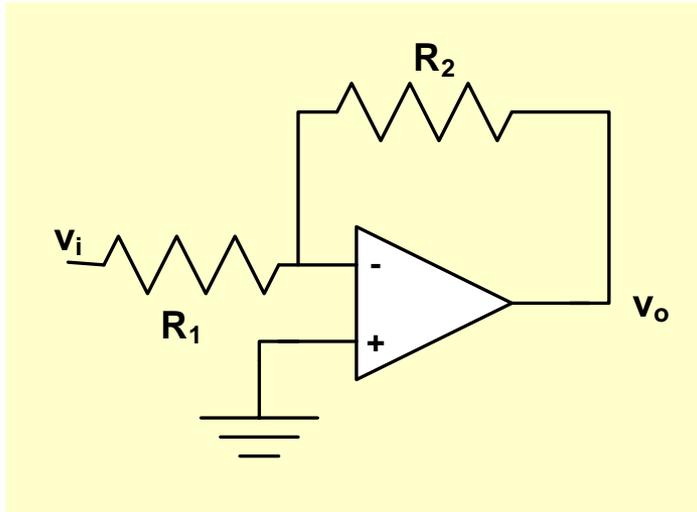
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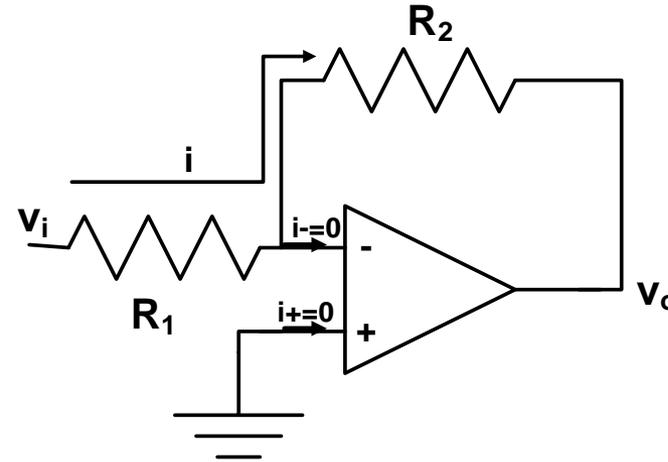
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## Amplificador de tensión inversor

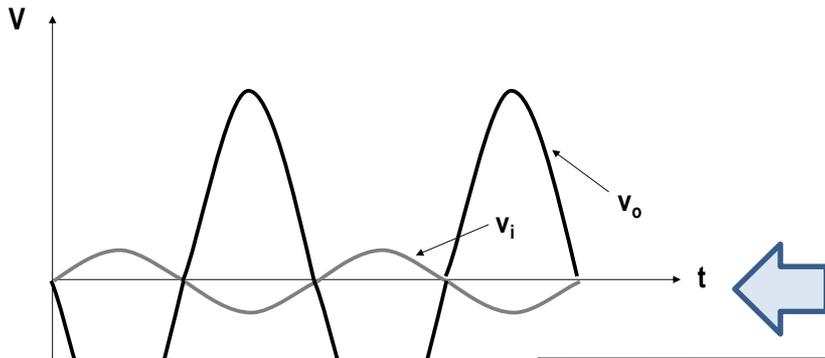


### ANÁLISIS



- Cortocircuito virtual:  $v_+ = v_-$
- $i(R_1) = i(R_2) = i$

$$\frac{v_i}{R_1} = \frac{-v_o}{R_2} \Rightarrow \frac{v_o}{v_i} = -\frac{R_2}{R_1}$$



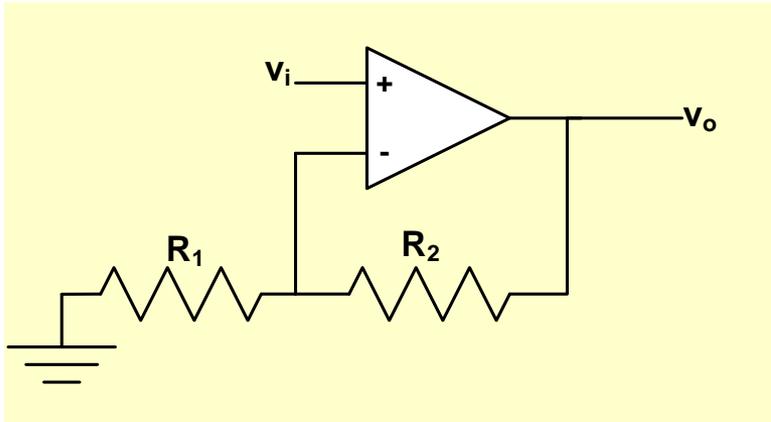
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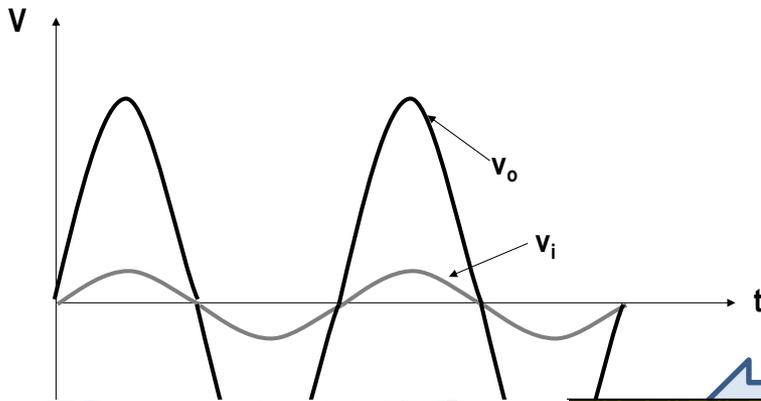
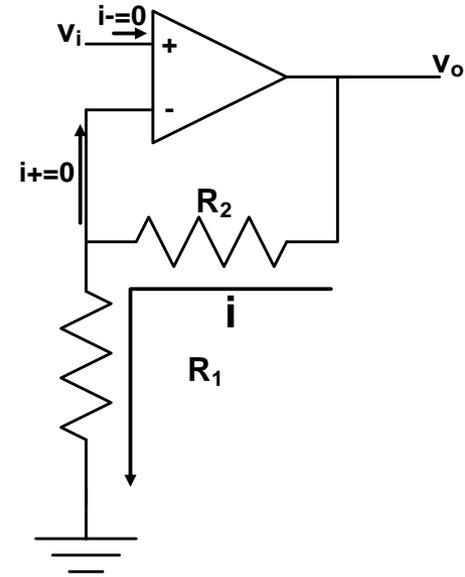
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## Amplificador de tensión no inversor



### ANÁLISIS



- Cortocircuito virtual:  $v_+ = v_-$
- $i(R_1) = i(R_2) = i$

$$v_i = R_1 \cdot i = R_1 \cdot \frac{v_o}{R_1 + R_2} \Rightarrow \frac{v_o}{v_i} = 1 + \frac{R_2}{R_1}$$

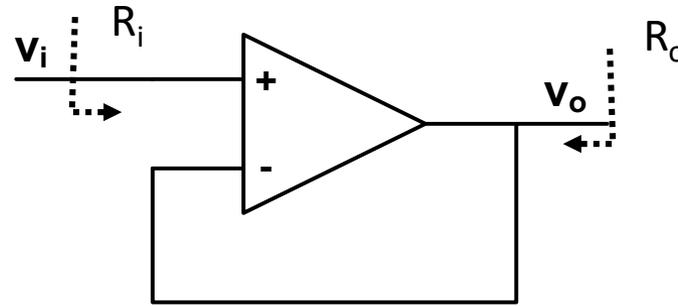
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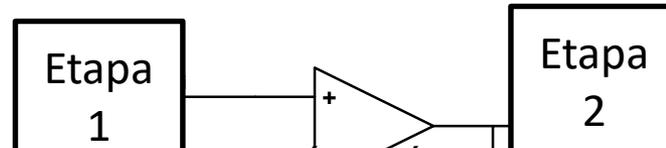
### Seguidor de tensión



- Cortocircuito virtual:  $v_+ = v_-$

$$v_o = v_i \Rightarrow \frac{v_o}{v_i} = 1$$

$R_i \rightarrow \infty$   
 $R_o \rightarrow 0$  }  $\Rightarrow$  ADAPTADOR DE  
IMPEDANCIAS



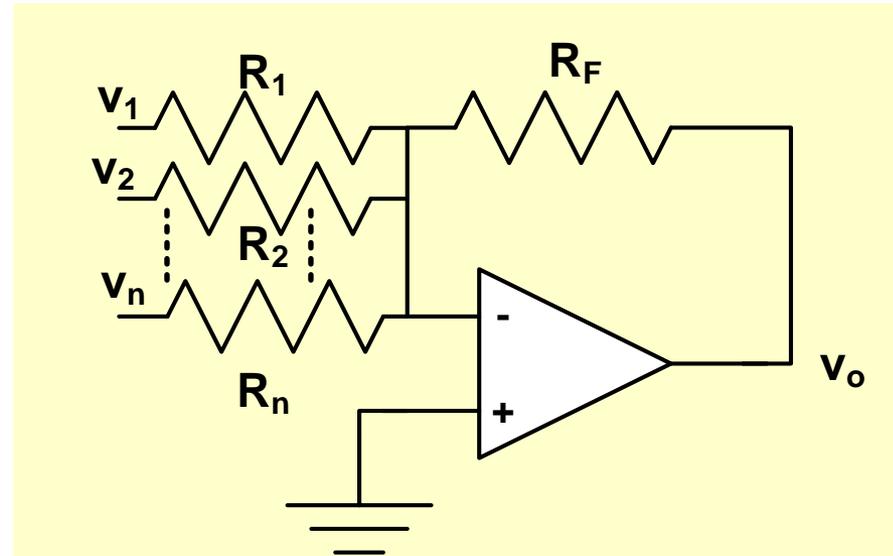
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## Amplificador sumador inversor



### ANÁLISIS

- Cortocircuito virtual:  $v_+ = v_-$
- $i(R_F) = i(R_1) + i(R_2) \dots + i(R_n)$

$$\frac{-v_o}{R_F} = \frac{v_1}{R_1} + \frac{v_2}{R_2} \dots + \frac{v_n}{R_n} \Rightarrow v_o = - \left( \frac{R_F}{R_1} v_1 + \frac{R_F}{R_2} v_2 \dots + \frac{R_F}{R_n} v_n \right)$$

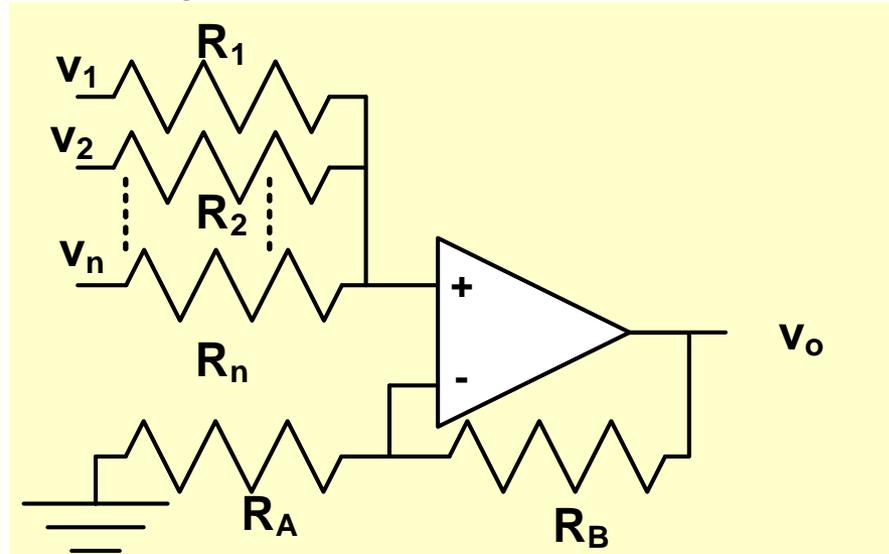
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### Amplificador sumador no inversor



### ANÁLISIS

- Cortocircuito virtual:  $v_+ = v_-$
- Principio de superposición

$$v_o = \left(1 + \frac{R_B}{R_A}\right) \cdot v_+ = \left(1 + \frac{R_B}{R_A}\right) \cdot (v_{+|v_1} + v_{+|v_2} \dots v_{+|v_n})$$

$$\Rightarrow v_o = \left(1 + \frac{R_B}{R_A}\right) \cdot \left( \frac{R_2 \parallel R_3 \parallel \dots \parallel R_n}{R_1 + R_2 \parallel R_3 \parallel \dots \parallel R_n} \cdot v_1 + \dots + \frac{R_1 \parallel R_2 \parallel \dots \parallel R_{n-1}}{R_1 + R_2 \parallel R_3 \parallel \dots \parallel R_n} \cdot v_n \right)$$

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