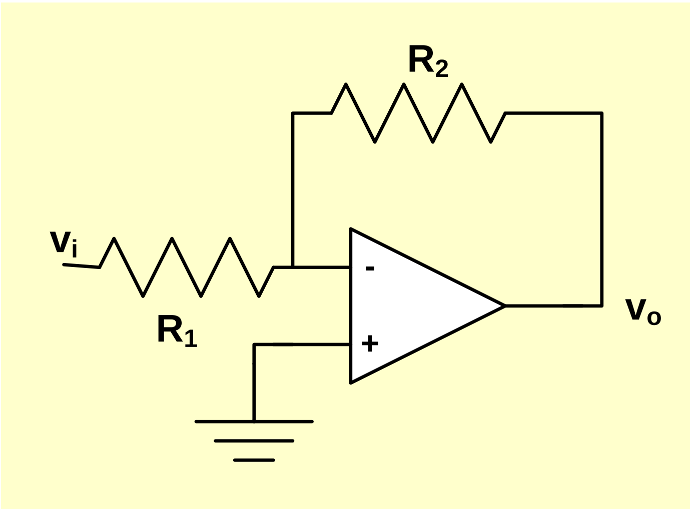
APLICACIONES LINEALES DE AMPLIFICADORES OPERACIONALES

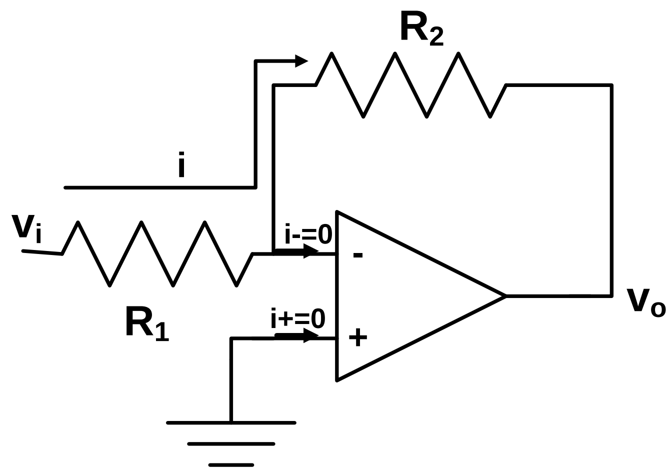
Amplificador operacional ideal: aplicaciones lineales

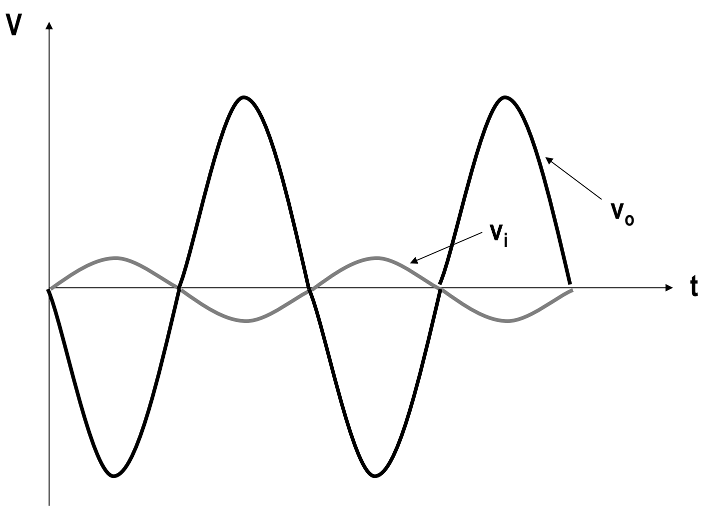
- Amplificador de tensión
- Seguidor de tensión
- Sumador
- Amplificador diferencial
- Amplificador de instrumentación
- Conversor corriente-tensión (transimpedancia)
- Conversor tensión-corriente (transadmitancia)
- Integrador ideal/ real
- Derivador ideal/real

Amplificador de tensión inversor



ANÁLISIS

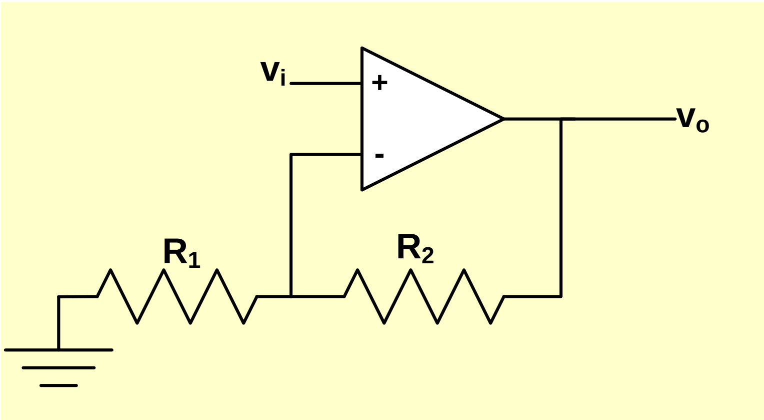




- Cortocircuito virtual:v+=v-
- $i(R_1)=i(R_2)=i$

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

Amplificador de tensión no inversor



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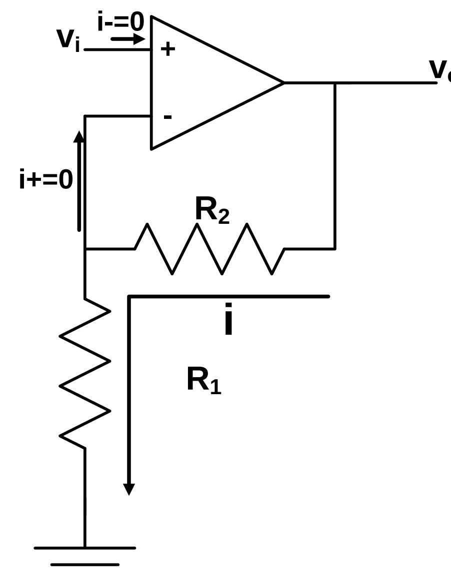
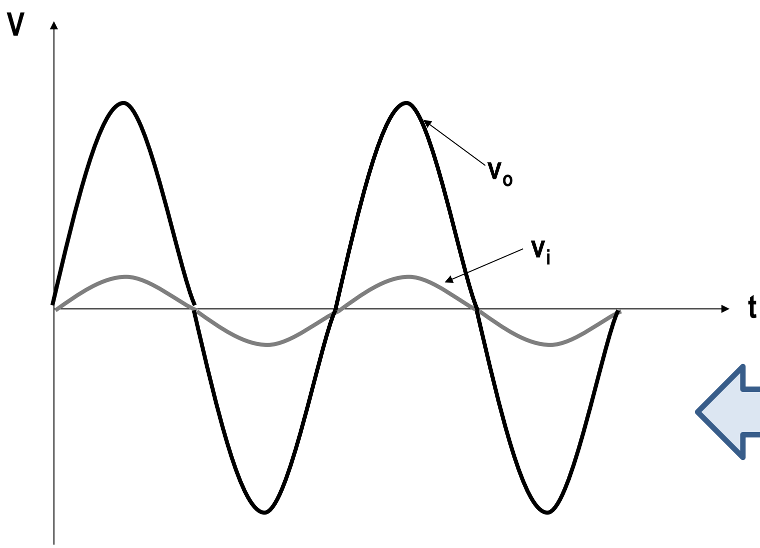
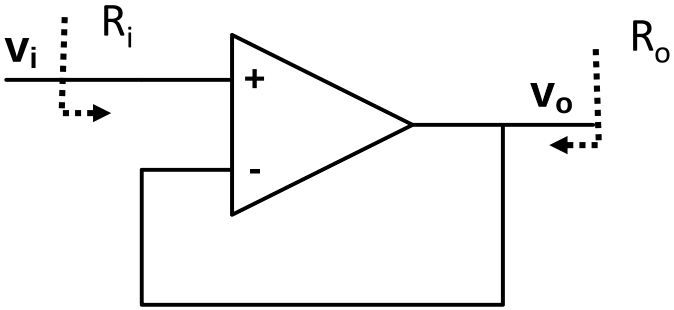




- Cortocircuito virtual:v+=v-
- $i(R_1)=i(R_2)=i$

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

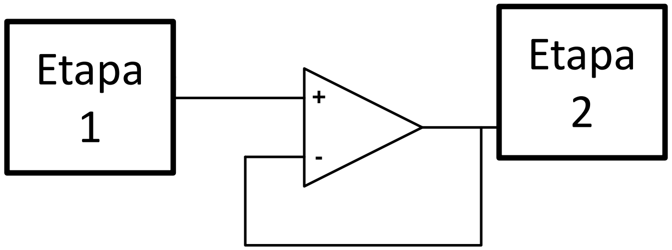
Seguidor de tensión



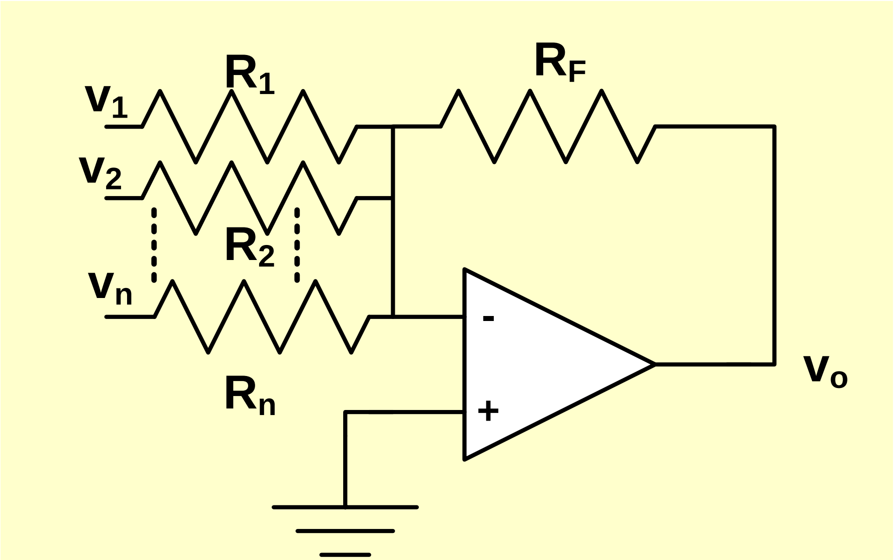
- Cortocircuito virtual:v+=v-

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

$$\left.\begin{array}{l} R_i \to \infty \\ R_o \to 0 \end{array}\right\} \Rightarrow$$ ADAPTADOR DE IMPEDANCIAS



Amplificador sumador inversor



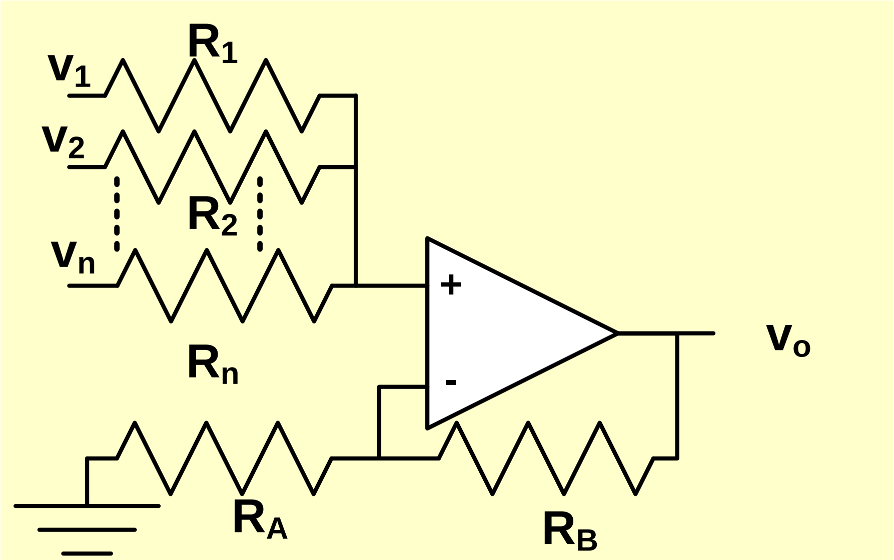
ANÁLISIS

- Cortocircuito virtual: v+ = v -
- $i(R_F) = i(R_1) + i(R_2)_{...} + i(R_n)$

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

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

Amplificador sumador no inversor



ANÁLISIS

- Cortocircuito virtual:v+ = v -
- Principio de superposición

$$v_o = \left(1+\frac{R_B}{R_A}\right)\cdot v_+ = \left(1+\frac{R_B}{R_A}\right)\cdot\left(v_+\big|_{v1} + v_+\big|_{v2} \ldots v_+\big|_{vn}\right)$$

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

$$n = 3 \qquad R_1 = R_2 = R_3 = R \Rightarrow v_o = \left(1+\frac{R_B}{R_A}\right)\cdot\frac{1}{3}\left(v_1 + v_2 + v_3\right)$$