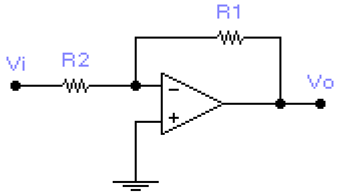
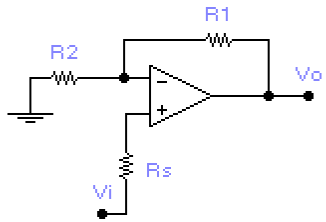
El amplificador operacional

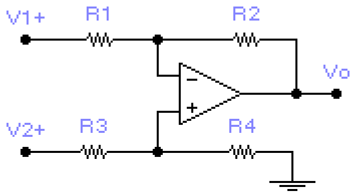
Circuitos básicos



$$V_o = -\frac{R_1}{R_2} V_i$$

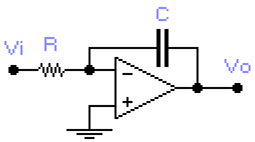


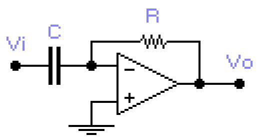
$$V_o = (1 + \frac{R_1}{R_2}) V_i$$



$$V_o = \frac{R_1 + R_2}{R_1} \frac{R_4}{R_3 + R_4} V_2 - \frac{R_1}{R_2} V_1$$

integrador y derivador



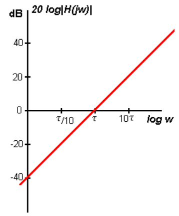


$$V_o = -RC \int V_i dt \qquad V_o = -RC \frac{dV_i}{dt}$$

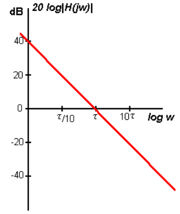
Análisis BODE

Fracciones posibles en el caso general

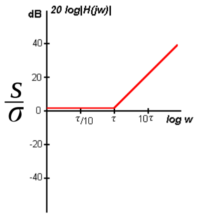
$$H_1(s) = \frac{s}{\sigma}$$



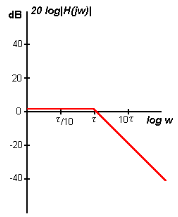
$$H_2(s) = \frac{\sigma}{s}$$



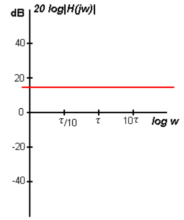
$$H_3(s) = 1 + \frac{s}{\sigma}$$



$$H_4(s) = \frac{1}{1 + \frac{s}{\sigma}}$$



$$H_0(s) = \kappa \frac{\alpha_1 \ldots \alpha_n}{\beta_1 \ldots \beta_m}$$



Si en el eje de las X la frecuencia se escribe en
potencias del 10, entonces la pendiente es de 20dB
potencias del 2, entonces la pendiente es de 6dB

Series de Fourier

$$v_{(t)periódica} = \sum_{n=0}^{\infty} \left[a_n \cos(n\frac{2\pi}{T_0}t) + b_n \sin(n\frac{2\pi}{T_0}t) \right]$$

$$a_o = \frac{1}{T_0} \int_0^{T_0} v_{(t)} dt \qquad a_n = \frac{2}{T_0} \int_0^{T_0} v_{(t)} \cos(n\frac{2\pi}{T_0}t) dt$$

$$b_n = \frac{2}{T_0} \int_0^{T_0} v_{(t)} \sin(n\frac{2\pi}{T_0}t) dt$$