OP Amp Basic Circuits 2

Voltage Follower

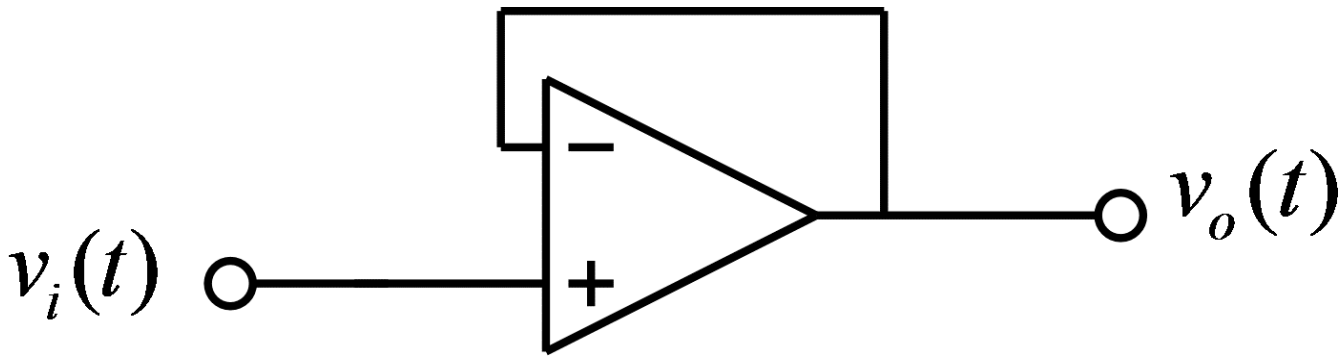
Integrator

Active Low-Pass Filter

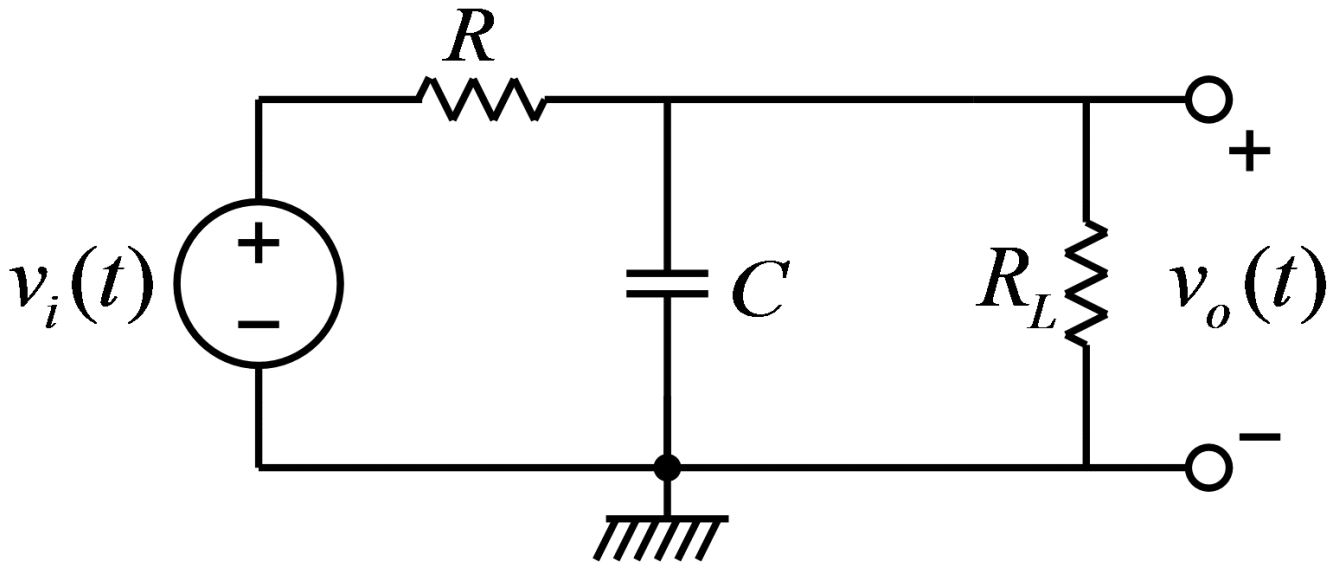
Differentiator

Voltage Follower/Impedance Buffer

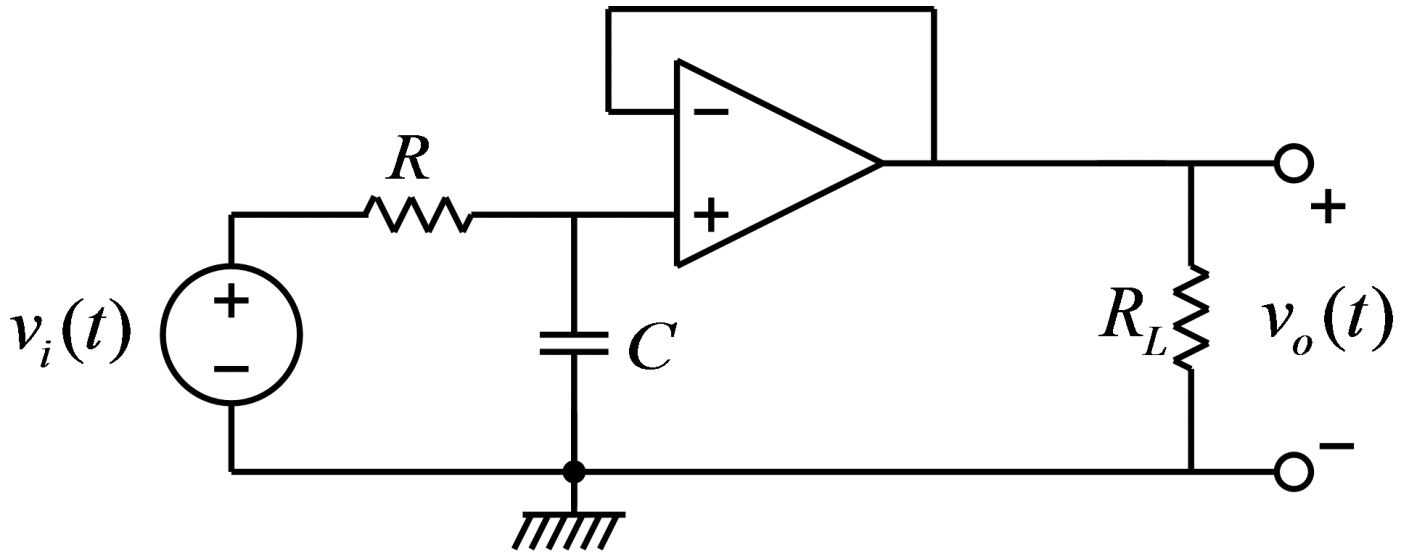
- Non-inverting amplifier: Gain = 1



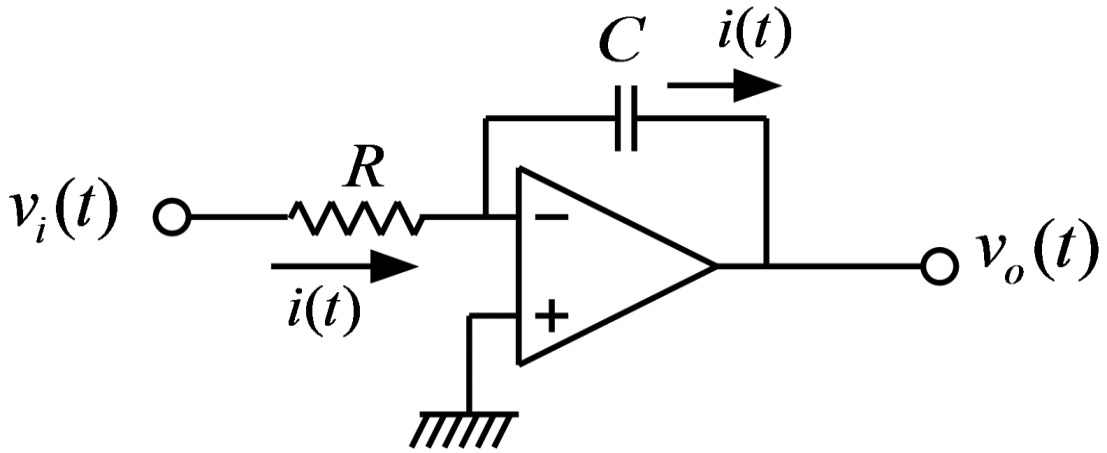
RC Low-Pass Filter



Buffered RC Low-Pass Filter



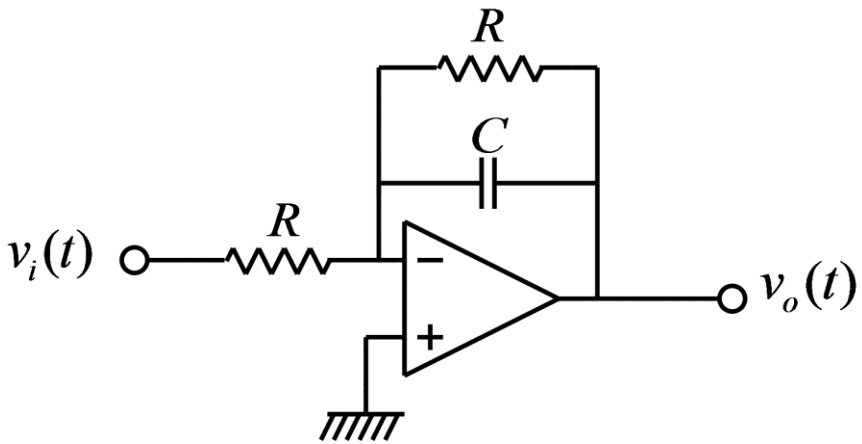
Integrator



$$i(t) = \frac{v_i(t)}{R}$$

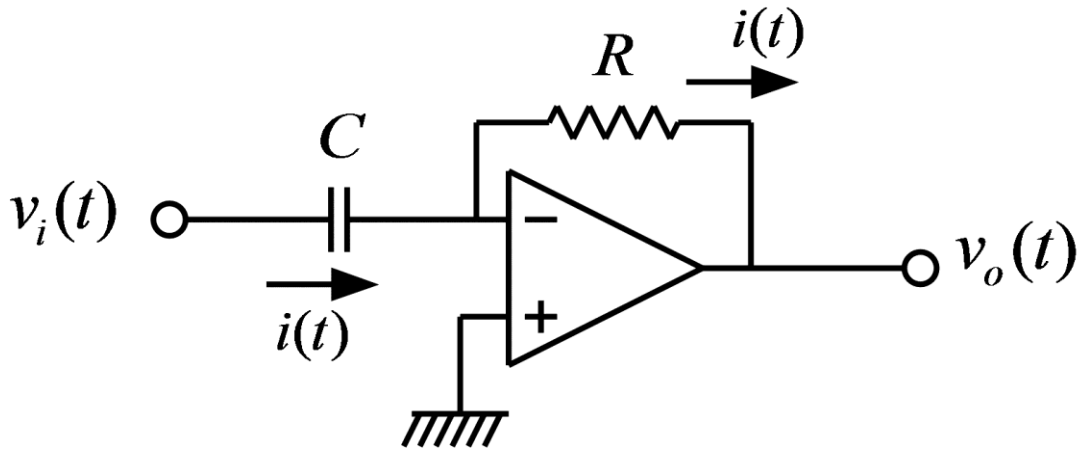
$$v_o(t) = -\frac{1}{C}\int_0^t i(\tau)d\tau + v_o(0) = -\frac{1}{RC}\int_0^t v_i(\tau)d\tau + v_o(0)$$

Active Low-Pass Filter



$$G(j\omega) = -\frac{\left(R \parallel \frac{1}{j\omega C}\right)}{R} = -\frac{1}{R}\left(\frac{\frac{R}{j\omega C}}{R + \frac{1}{j\omega C}}\right) = -\frac{1}{j\omega RC + 1}$$

Differentiator



$$i(t) = C\frac{dv_i(t)}{dt}$$

$$v_o(t) = -Ri(t) = -RC\frac{dv_i(t)}{dt}$$

$$v_i(t) = A\cos\omega t \Rightarrow v_o(t) = RCA\omega\sin\omega t$$