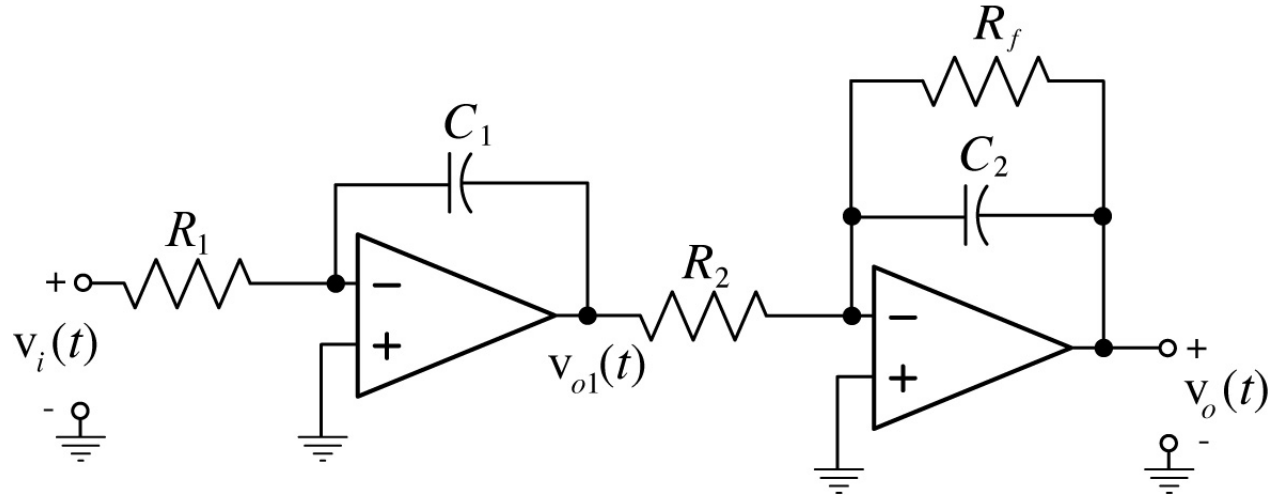


$$v_i(t)/R_1 = -C_1\, v'_{o1}(t) \quad , \quad v_{o1}(t)/R_2 = -C_2\, v'_o(t) - v_o(t)/R_f$$

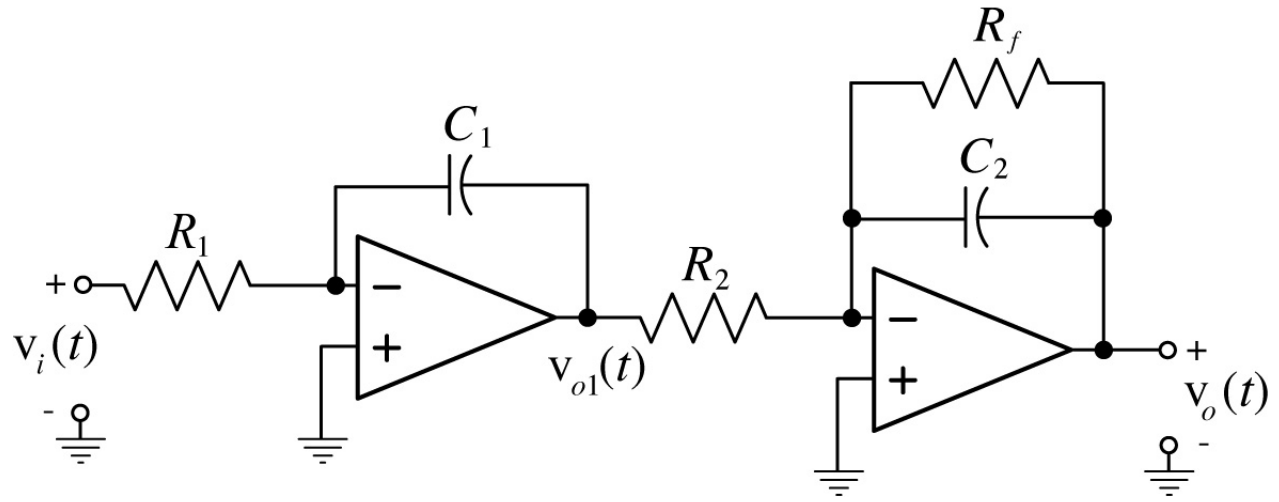
$$v_{o1}(t) = -R_2C_2\, v'_o(t) - v_o(t)R_2/R_f$$

$$v'_{o1}(t) = -R_2C_2\, v''_o(t) - v'_o(t)R_2/R_f$$

$$v_i(t)/R_1 = -C_1\left[-R_2C_2\, v''_o(t) - v'_o(t)R_2/R_f\right]$$

$$R_1R_2C_1C_2\, v''_o(t) + v'_o(t)R_1C_1R_2/R_f = v_i(t)$$

$$v''_o(t) + \frac{v'_o(t)}{R_fC_2} = \frac{1}{R_1R_2C_1C_2}v_i(t)$$



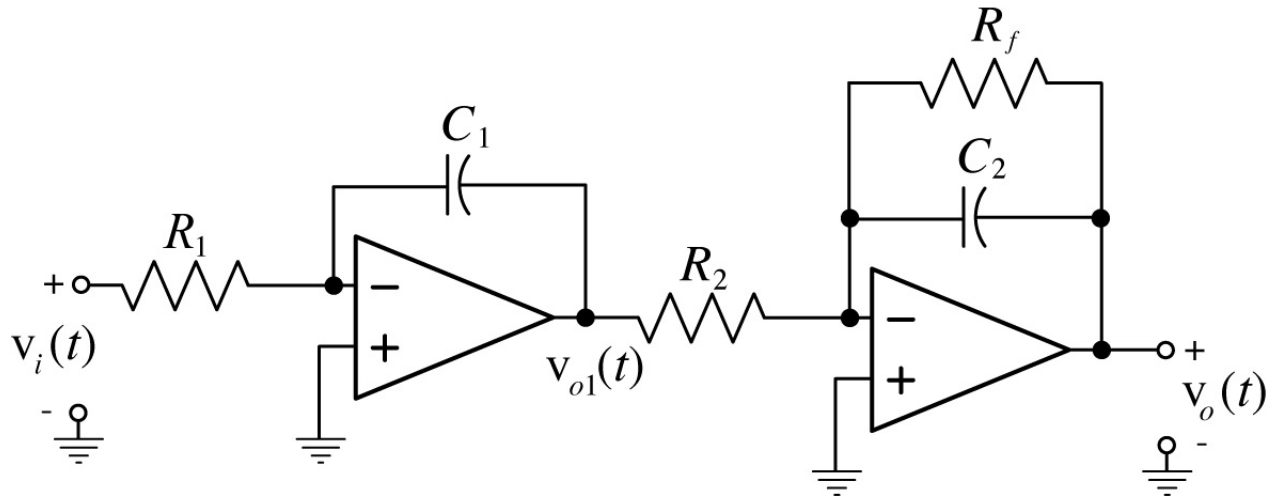
$$v_i(t)/R_1 = -C_1\, v'_{o1}(t) \quad , \quad v_{o1}(t)/R_2 = -C_2\, v'_o(t) - v_o(t)/R_f$$

$$v''_o(t) + \frac{v'_o(t)}{R_f C_2} = \frac{1}{R_1 R_2 C_1 C_2} v_i(t)$$

$$s^2 V_o(s) - s\, v_o(0^-) - \left(\frac{d}{dt}(v_o(t))\right)_{t=0^-} + \frac{1}{R_f C_2}\left(s V_o(s) - v_o(0^-)\right) = \frac{1}{R_1 R_2 C_1 C_2} V_i(s)$$

Let $v_o(0^-) = 0$ and $\left(\frac{d}{dt}(v_o(t))\right)_{t=0^-} = 0$ and $V_i(s) = 1/s$.

$$s^2 V_o(s) + \frac{s V_o(s)}{R_f C_2} = \frac{1}{s R_1 R_2 C_1 C_2} \Rightarrow V_o(s) = \frac{1}{R_1 R_2 C_1 C_2} \times \frac{1}{s^2\left(s + 1/R_f C_2\right)}$$



$$V_o(s) = \frac{1}{R_1 R_2 C_1 C_2} \times \frac{1}{s^2\left(s + 1/R_f C_2\right)}$$

Let $R_1 = 10\ \text{k}\Omega$, $R_2 = 1\ \text{k}\Omega$, $C_1 = 20\ \text{nF}$, $C_2 = 50\ \text{nF}$, $R_f = 20\ \text{k}\Omega$

$$V_o(s) = \frac{10^8}{s^2(s+1000)} = 100\left[\frac{1000}{s^2} - \frac{1}{s} + \frac{1}{s+1000}\right]$$

$$v_o(t) = 100\left[1000\,\text{ramp}(t) - \left(1 - e^{-1000t}\right)u(t)\right]$$