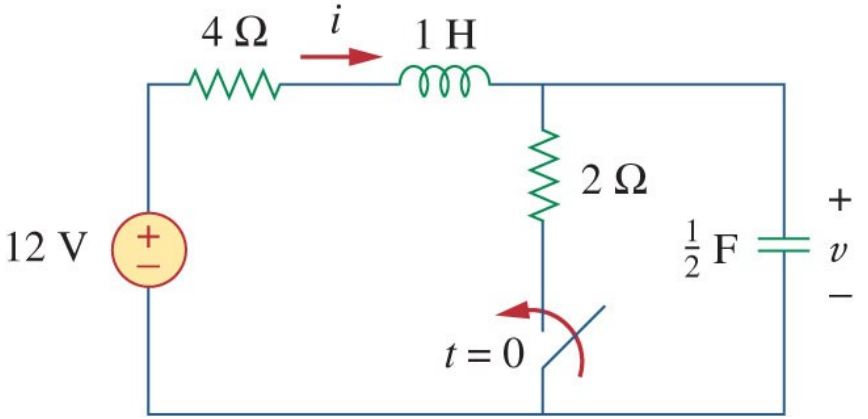
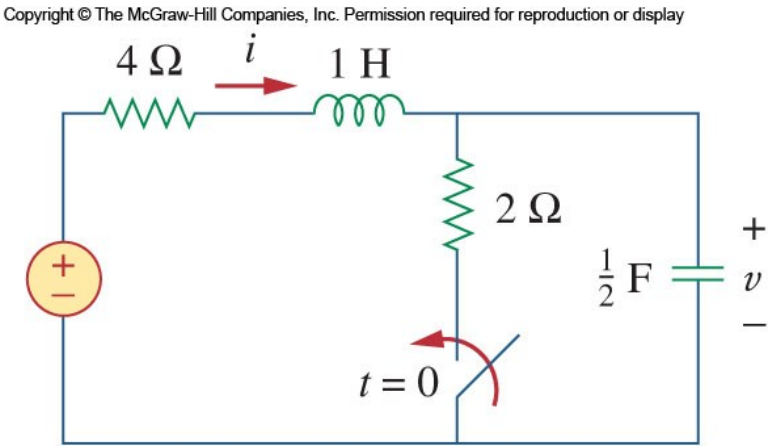
- Use mesh analysis method to find the complete response $v(t)$ for $t > 0$ in the circuit.



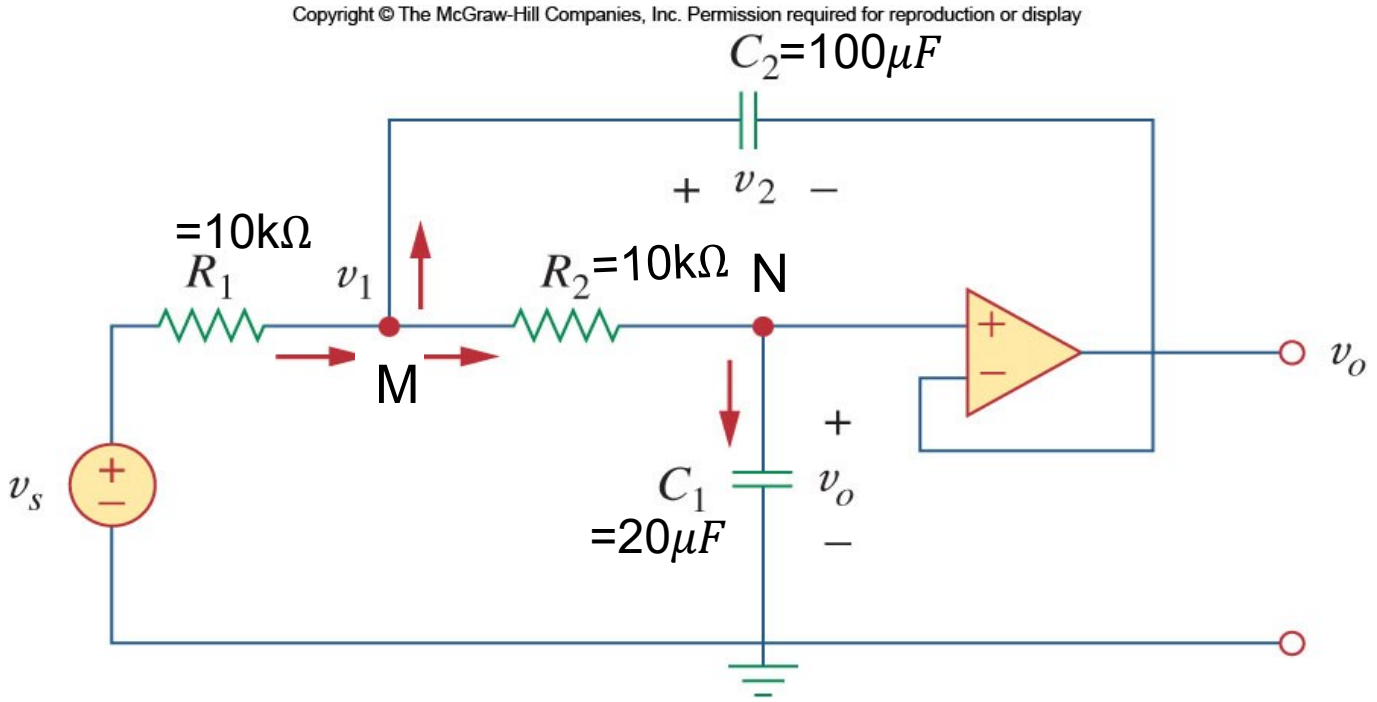
Find *v(t) for t>0*

$e^{-t}u(t)$



Example of 2nd-order op-amp circuits

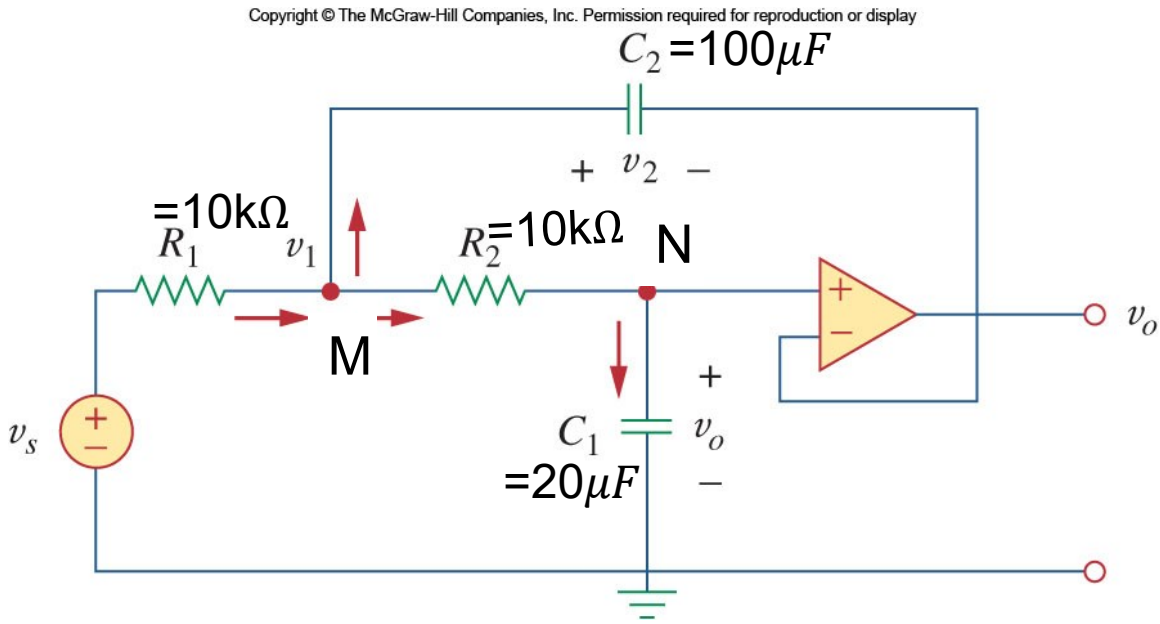
- Find v_o for $t > 0$ when $v_s = 10u(t)mV$.



Initial conditions: $v_o(0^+) = 0$, $C_1 \frac{dv_o(0^+)}{dt} = \frac{v_1(0^+) - v_o(0^+)}{R_2} = \frac{v_2(0^+)}{R_2} = 0$

Example of 2nd-order op-amp circuits

- Find v_o for $t > 0$ when $v_s = 10u(t)mV$.



KCL at node M:

$$\frac{v_s - v_1}{R_1} = C_2\frac{dv_2}{dt} + \frac{v_1 - v_o}{R_2}$$

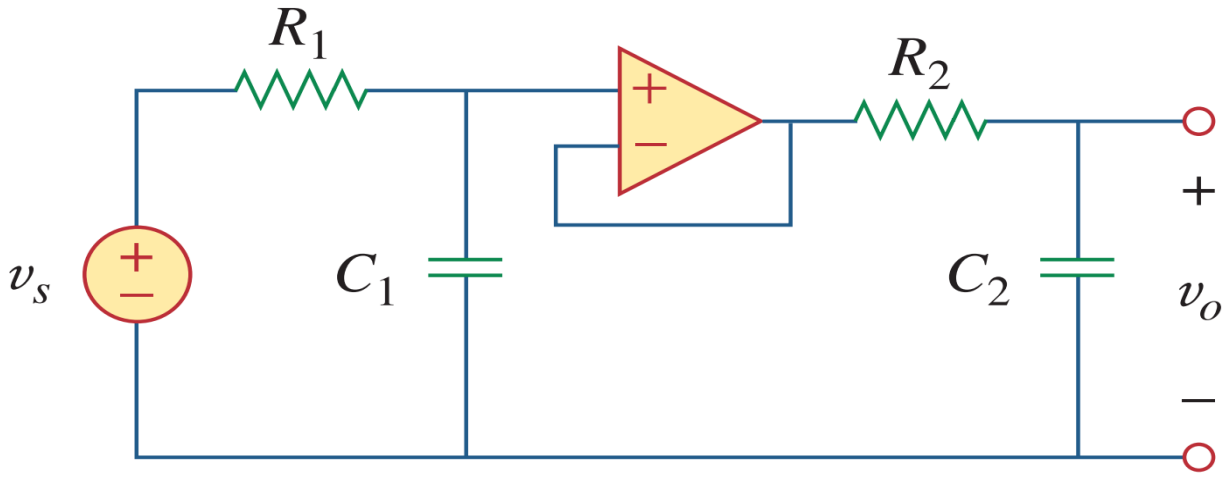
KCL at node N:

$$C_1\frac{dv_o}{dt} = \frac{v_1 - v_o}{R_2} \qquad and\ we\ have\ v_1 - v_2 = v_o$$

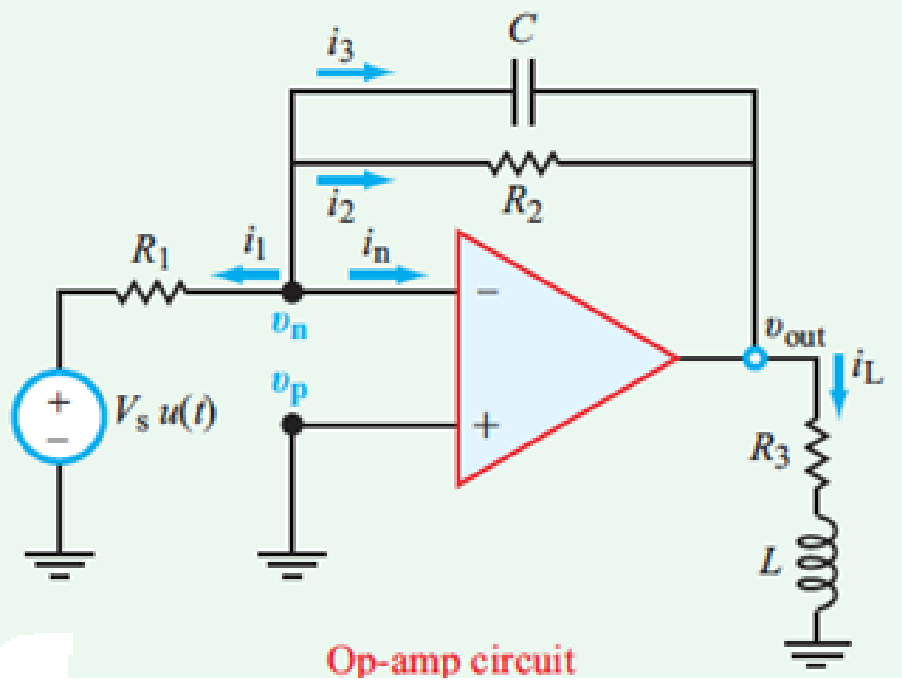
$$\Rightarrow \quad \frac{d^2v_o}{dt^2} + \left(\frac{1}{R_1C_2} + \frac{1}{R_2C_2}\right)\frac{dv_o}{dt} + \frac{v_o}{R_1R_2C_1C_2} = \frac{v_s}{R_1R_2C_1C_2}$$

Example

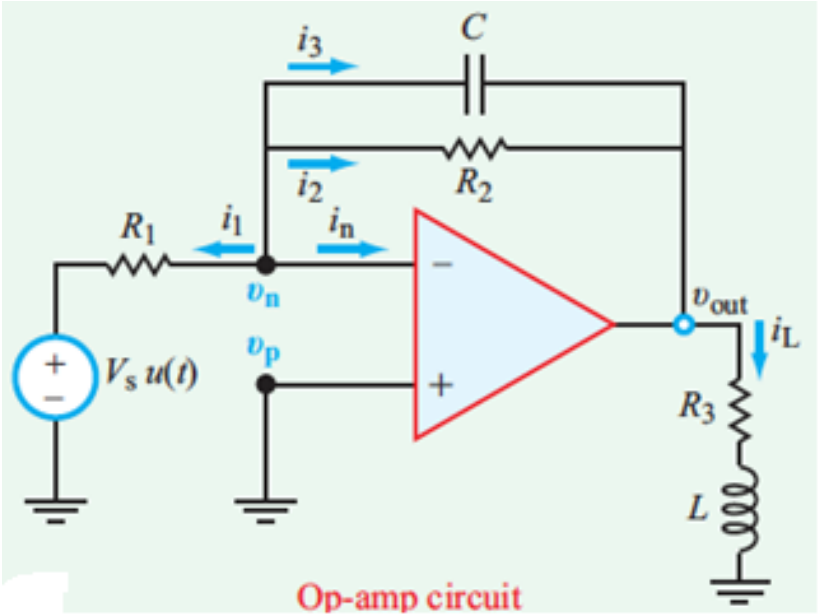
In the op amp circuit shown in Fig. 8.34, $v_s = 10u(t)$ V, find $v_o(t)$ for $t > 0$. Assume that $R_1 = R_2 = 10\ \text{k}\Omega$, $C_1 = 20\ \mu\text{F}$, and $C_2 = 100\ \mu\text{F}$.



Example-2
find current through the inductor for t>0



Example-2



$$i_L(0) = i_L(0^-) = 0, \quad i_L'(0) = \frac{1}{L}\, v_L(0) = 0.$$

$$\frac{R_3}{R_2}\, i_L + \left(\frac{L}{R_2} + R_3 C\right) \frac{di_L}{dt} + LC\, \frac{d^2 i_L}{dt^2} = -\frac{V_s}{R_1}$$