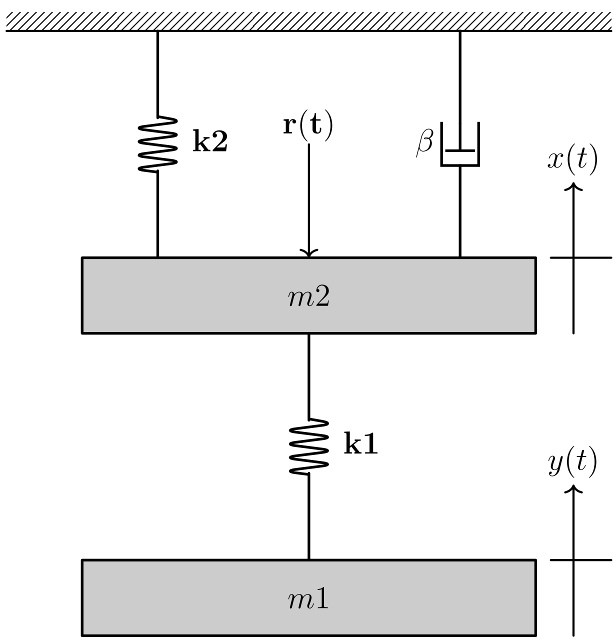
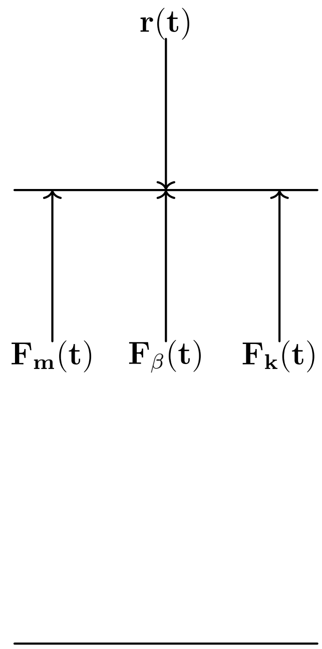
# 1 Ejercicio # 1

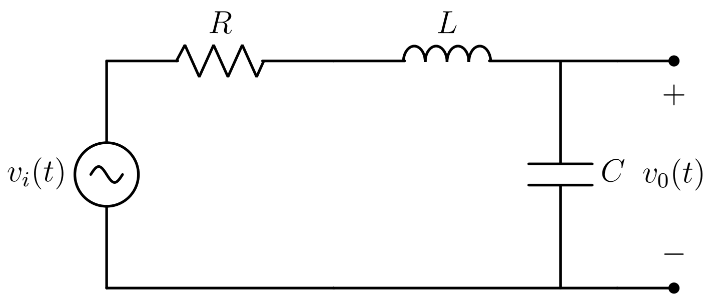
Hallar ecuación diferencial: $FT_1(s) = \dfrac{X(s)}{R(s)}$ y $FT_2(s) = \dfrac{Y(s)}{R(s)}$.



## 2 Ejercicio # 2

Hallar: $\frac{V_o(s)}{V_i(s)}$




aAplicamos la ley de Kirchhoff de las mallas:

$$v_i(t) = v_R(t) + v_L(t) + v_C(t)$$

Donde:

$$v_C(t) = \frac{1}{C}\int i_C(t)\mathrm{d}t$$

$$v_L(t) = L\frac{\mathrm{d}i(t)}{\mathrm{d}t}$$

$$v_R(t) = Ri(t)$$

Ecuación diferencial del circuito RLC:

$$v_i(t) = Ri(t) + L\frac{\mathrm{d}i(t)}{\mathrm{d}t} + \frac{1}{C}\int i_C(t)\mathrm{d}t$$

Aplicamos la transformada de Laplace:

$$\mathscr{L}\{v_i(t)\} = \mathscr{L}\{v_R(t) + v_L(t) + v_C(t)\}$$

$$\mathscr{L}\{v_i(t)\} = \mathscr{L}\left\{Ri(t) + L\frac{\mathrm{d}i(t)}{\mathrm{d}t} + \frac{1}{C}\int i_C(t)\mathrm{d}t\right\}$$

$$V_i(s) = RI(s) + LSI(s) + \frac{1}{CS}I(s)$$

$$V_i(s) = I(s)\left(R + LS + \frac{1}{CS}\right)$$

$$V_i(s) = I(s)\left(\frac{S^2LC + 1 + SRC}{SC}\right)$$

$$I(s) = V_i(s)\left(\frac{SC}{S^2LC + 1 + SRC}\right)$$

Aplicamos la Ley de tension de Kirchhoff:

$$-v_o(t) + v_c(t) = 0$$

$$v_o(t) = v_C(t) = \frac{1}{C}\int i_C(t)\mathrm{d}t$$

$$\mathscr{L}\{v_o(t)\} = \mathscr{L}\left\{\frac{1}{C}\int i_C(t)\mathrm{d}t\right\}$$

$$V_o(s) = \frac{1}{CS}I(s)$$

Luego reemplazamos:

$$V_o(s) = \frac{1}{SC}\left[V_i(s)\left(\frac{SC}{S^2LC + 1 + SRC}\right)\right]$$

$$V_o(s) = V_i(s)\left(\frac{1}{S^2LC + 1 + SRC}\right)$$

Solución:

$$\boxed{\frac{V_o(s)}{V_i(s)} = \frac{1}{S^2LC + 1 + SRC}}$$

# 3 Ejercicio # 3