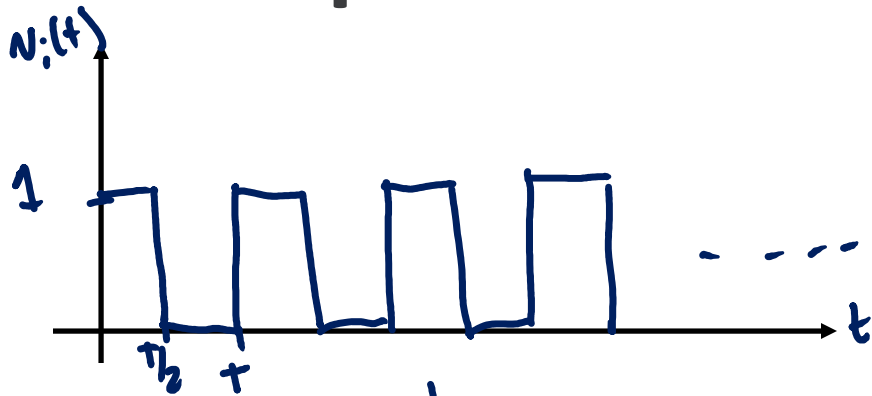


Example Problem



$$v_i(t) = \sum_{k=0}^{\infty} u(t-kT) - u(t-\frac{T}{2}-kT)$$

$$V_I(s) = \frac{\frac{1}{s} - \frac{1}{s} e^{-s\frac{T}{2}}}{1 - e^{-sT}} = \frac{1}{s} \frac{(1 - e^{-s\frac{T}{2}})}{1 - e^{-sT}}$$

$$H(s) = \frac{R_2}{R_1} \frac{1}{sR_2C + 1}$$

$$V_o(s) = H(s) V_I(s) = \underbrace{\frac{R_2}{R_1} \frac{1}{sR_2C + 1}}_{F(s)} \underbrace{\frac{1}{s} \frac{(1 - e^{-s\frac{T}{2}})}{1 - e^{-sT}}}_{V_I(s)}$$

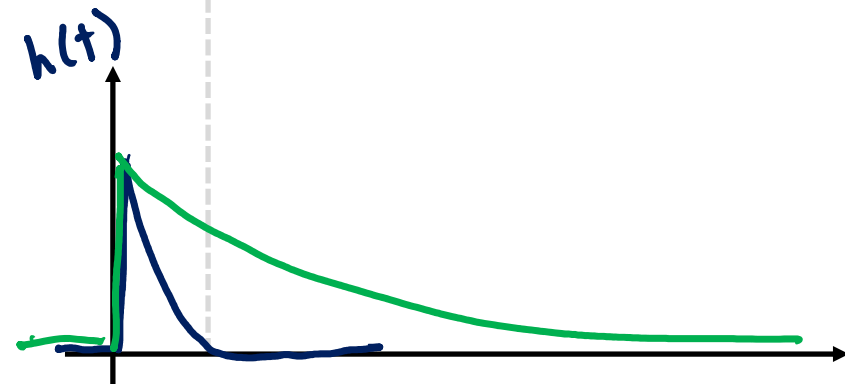
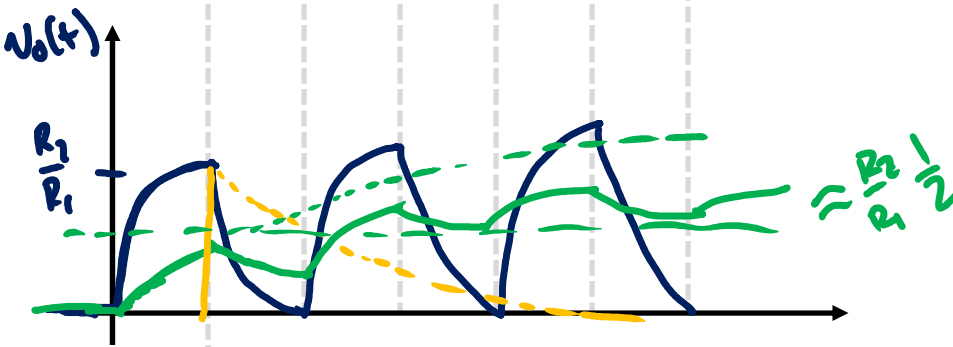
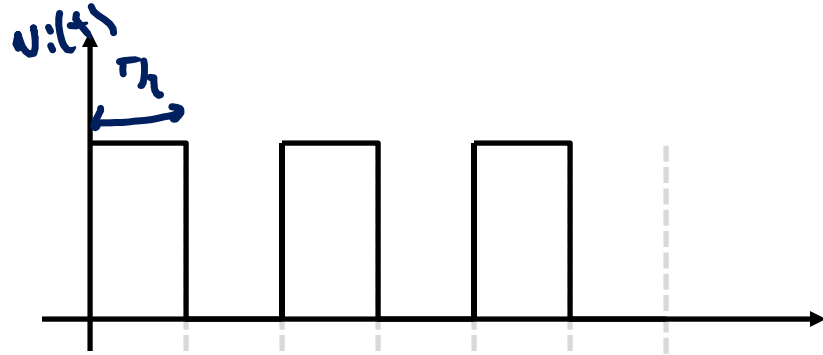
$$F(s) = \frac{R_2}{R_1} \frac{1}{sR_2C + 1} \frac{1}{s} = \frac{k_1}{s} + \frac{k_2}{sR_2C + 1} = \frac{R_2}{R_1} \frac{1}{s} - \frac{R_2}{R_1} \frac{1}{s + \frac{1}{R_2C}}$$

$$k_1 = \frac{R_2}{R_1}$$

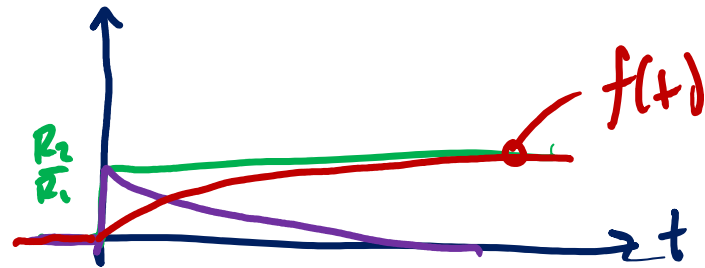
$$k_2 = \frac{R_2}{R_1} \frac{1}{s} \Big|_{s = -\frac{1}{R_2C}} = \frac{-R_2 R_2 C}{R_1}$$

$$f(t) = \frac{R_2}{R_1} \left[1 - e^{-\frac{1}{R_2C}t} \right] u(t)$$

$$V_o(t) = \sum_{k=0}^{\infty} \frac{R_2}{R_1} \left[1 - e^{-\frac{1}{R_2C}(t-kT)} \right] u(t-kT) - \frac{R_2}{R_1} \left[1 - e^{-\frac{1}{R_2C}(t+kT-\frac{T}{2})} \right] u(t+kT-\frac{T}{2})$$



$$f(t) = \frac{R_2}{R_1} \left[1 - e^{-\frac{t}{R_2 C}} \right] u(t)$$



if $R_2 C \ll \frac{T}{2}$

exponential goes through many time constants before next term

if $R_2 C \gg \frac{T}{2}$

get through less than one time constant

$$H(s) = \frac{R_2}{R_1} \frac{1}{sR_2 C + 1} = \frac{R_2}{R_1} \frac{\frac{1}{R_2 C}}{s + \frac{1}{R_2 C}}$$

$$h(t) = \frac{R_2}{R_1} \frac{1}{R_2 C} e^{-\frac{t}{R_2 C}} u(t)$$