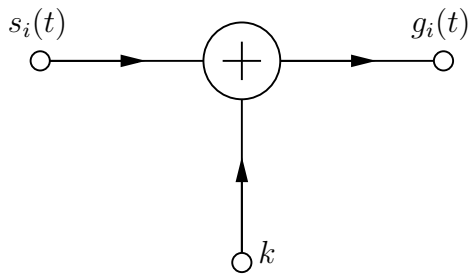
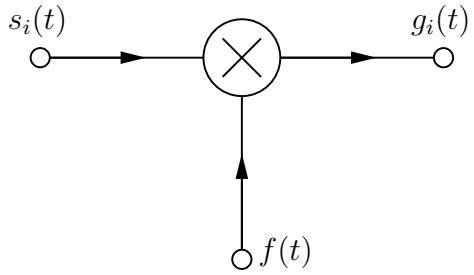
Exercise 15:

Examine the following systems on linearity and time-invariance:

(a) $g_i(t) = k + s_i(t)$

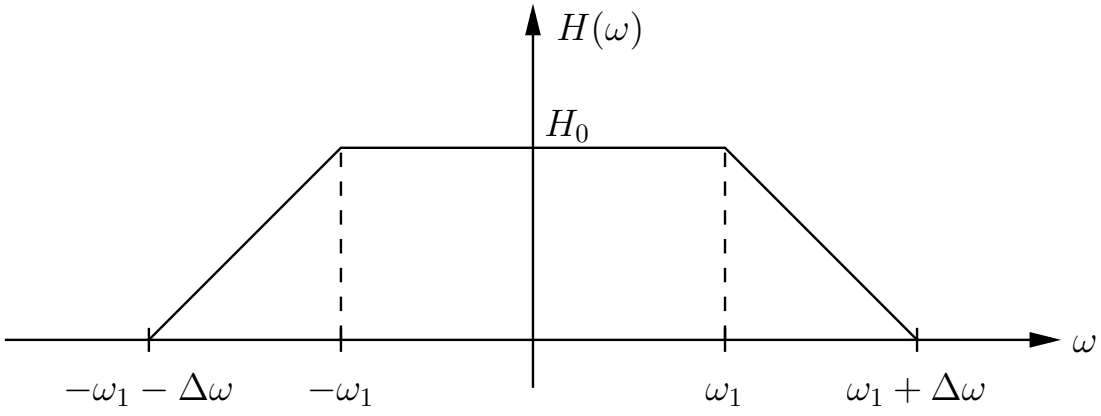


(b) $g_i(t) = f(t) \cdot s_i(t)$



Exercise 16:

Determine the impulse response of a linear, time-invariant transmission system with the sketched transfer function



Hint:
Represent the sketched transfer function as a convolution of two rect-functions and determine the impulse response by means of the standard table of Fourier transforms.

Exercise 17:

(a) Determine $h(t)$ for the RC-Lowpass. Note that this low-pass responds to

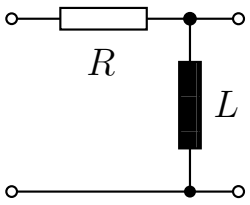
$$s(t) \quad = \quad \varepsilon(t) \quad \text{with} \quad u_c(t) = g(t) = \left(1 - e^{-\frac{t}{RC}}\right) \qquad \forall t \geq 0$$

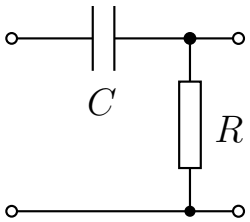
(b) Describe graphically the response of RC-Lowpass to rect $\left(\frac{t}{T} - 0,5\right)$
with $\tau = RC$ for $\tau \in \{0.2,\ 1.0,\ 5.0\} \cdot T$
Note: $e^{-1} = 0.63$; $e^{-5} = 0.007$; $e^{-0.2} = 0.82$

(c) Do the same for the RC-Highpass.

(d) Determine $H(\omega)$ for the following two networks by means of network analysis and using impedances $Z_L = j\omega L$, $Z_c = \frac{1}{j\omega C}$

(e) Determine $H_{\mathrm{L}}(p)$ for the following two networks (still using network analysis)





(f) Determine $h(t)$ by means of Laplace-Transform.