

$$h(t) = 2u(t) - 2u(t-1) \xrightarrow{\text{Laplace}} 2U(s) - 2e^{-s}U(s) = 2(1-e^{-s})U(s)$$

$$= 2 \frac{1-e^{-s}}{s} \quad \text{ROC} = \mathbb{C}$$

Modulung:

$f(t) \xrightarrow{\text{Laplace}} F(s)$
 $t \in \mathbb{R}$

Verschiebungssatz
 $f(t-t_0) \xrightarrow{\text{Laplace}} \int_{-\infty}^{+\infty} f(t-t_0) e^{-st} dt = \int_{-\infty}^{+\infty} f(\tau) e^{-s(\tau+t_0)} d\tau$
 Subst. $t-t_0 = \tau$
 $t = \tau+t_0$
 $dt = d\tau$
 $= e^{-st_0} \int_{-\infty}^{+\infty} f(\tau) e^{-s\tau} d\tau = e^{-st_0} F(s)$

$$h(t) = \begin{cases} 2 & 0 \leq t < 1 \\ 0 & t < 0 \text{ oder } t > 1 \end{cases}$$

$$H(s) = \int_0^1 2 \cdot e^{-st} dt = 2 \frac{e^{-st}}{-s} \Big|_0^1 = \frac{2}{-s} (e^{-s} - 1) = 2 \frac{1-e^{-s}}{s}$$

$$\text{ROC} = \mathbb{C}$$

$$\hat{h}(\omega) = H(j\omega) = 2 \frac{1-e^{-j\omega}}{j\omega}$$



$$g(t) = u(t) + u(t-1) - u(t-2) - u(t-3)$$

$$G(s) = \frac{1}{s} + e^{-s} \frac{1}{s} - e^{-2s} \frac{1}{s} - e^{-3s} \frac{1}{s}$$

$$= \frac{1}{s} (1 + e^{-s} - e^{-2s} - e^{-3s})$$

$$\hat{g}(\omega) = G(j\omega) = \frac{1}{j\omega} (1 + e^{-j\omega} - e^{-j2\omega} - e^{-j3\omega})$$

Sp:



$$h(t) = \frac{1}{2} t u(t) - 2 \cdot \frac{1}{2} (t-2) u(t-2) + \frac{1}{2} (t-4) u(t-4)$$

$$H(s) = \frac{1}{2} \cdot \frac{1}{s^2} - 2 \cdot \frac{1}{2} \cdot e^{-s2} \cdot \frac{1}{s^2} + \frac{1}{2} \cdot e^{-s4} \cdot \frac{1}{s^2}$$