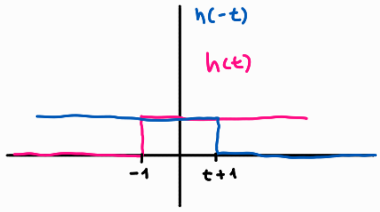
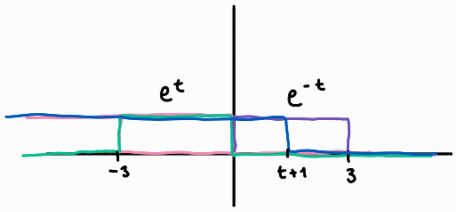
b) $h(t) = e^{-\frac{5}{7}t}\, u(t+1)$ $\qquad x(t) = e^{t}\,[u(-t) - \underbrace{u(-t-3)}_{u(-(t+3))}] + e^{-t}\,[u(t) - u(t-3)]$



$$h(t-\tau) = e^{-\frac{5}{7}(t-\tau)}\, u(-\tau + (t+1))$$

$$x(\tau) = e^{\tau}[u(-\tau) - u(-\tau-3)] + e^{-\tau}[u(\tau) - u(\tau-3)]$$

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} e^{\tau}[u(-\tau) - u(-\tau-3)] + e^{-\tau}[u(\tau) - u(\tau-3)]\, e^{-\frac{5}{7}(t-\tau)}\, u(-\tau+(t+1))\, d\tau$$



$t+1 < -3 \qquad y(t) = 0$

$t < -4$

$-3 \le t+1 < 0$

$-4 \le t < -1$

$$y(t) = \int_{-3}^{t+1} e^{\tau} e^{-5/7\,t} e^{\frac{5}{7}\tau} d\tau = e^{-5/7\,t} \int_{-3}^{t+1} e^{\frac{12\tau}{7}} d\tau = \frac{7}{12} e^{-5/7\,t} e^{\frac{12}{7}\tau}\Big|_{-3}^{t+1}$$
$$= \frac{7}{12} e^{-5/7\,t}\left(e^{\frac{12}{7}(t+1)} - e^{-36/7}\right)$$

$0 \le t+1 < 3$

$-1 \le t < 2$

$$y(t) = \int_{-3}^{0} e^{\tau} e^{-5/7\,t} e^{\frac{5}{7}\tau} d\tau + \int_{0}^{t+1} e^{-\tau} e^{-5/7\,t} e^{\frac{5}{7}\tau} d\tau = e^{-5/7\,t}\int_{-3}^{0} e^{\frac{12}{7}\tau} d\tau + e^{-5/7\,t}\int_{0}^{t+1} e^{-\frac{2}{7}\tau} d\tau$$
$$= \frac{7}{12} e^{-5/7\,t} e^{12/7\,\tau}\Big|_{-3}^{0} - \frac{7}{2} e^{-5/7\,t} \cdot e^{-2/7\,\tau}\Big|_{0}^{t+1} = \frac{7}{12} e^{-5/7\,t}(1 - e^{-36/7}) - \frac{7}{2} e^{-5/7\,t}(e^{-2/7(t+1)} - 1)$$

$t+1 \ge 3 \quad \rightarrow \quad t \ge 2$

$$y(t) = \int_{-3}^{0} e^{\tau} e^{-5/7\,t} e^{5/7\,\tau} d\tau + \int_{0}^{3} e^{-\tau} e^{-5/7\,t} e^{5/7\,\tau} d\tau = \frac{7}{12} e^{-5/7\,t} e^{12/7\,\tau}\Big|_{-3}^{0} - \frac{7}{2} e^{-5/7\,t} e^{-2/7\,\tau}\Big|_{0}^{3}$$
$$= \frac{7}{12} e^{-5/7\,t}(1 - e^{-36/7}) - \frac{7}{2} e^{-5/7\,t}(e^{-6/7\,t} - 1)$$

$$y(t) = \begin{cases} 0 & t < -4 \\ \frac{7}{12} e^{-5/7\,t}\left(e^{\frac{12}{7}(t+1)} - e^{-36/7}\right) & -4 \le t < -1 \\ \frac{7}{12} e^{-5/7\,t}(1 - e^{-36/7}) - \frac{7}{2} e^{-5/7\,t}(e^{-2/7(t+1)} - 1) & -1 \le t < 2 \\ \frac{7}{12} e^{-5/7\,t}(1 - e^{-36/7}) - \frac{7}{2} e^{-5/7\,t}(e^{-6/7\,t} - 1) & t \ge 2 \end{cases}$$