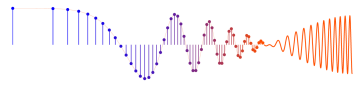


EXERCISE 9.7: Repeat the convolution of $x(t) = u(t - 1)$ with $h(t) = e^{-t}u(t)$, but this time use the convolution integral form

$$y(t) = \int_{-\infty}^{\infty} x(\tau)h(t - \tau)d\tau$$

Because convolution is commutative, your answer should be the same as (9.52).



$$x(t) = u(t-1) \text{ and } h(t) = e^{-t}u(t)$$

$$y(t) = \int_{-\infty}^{\infty} x(\tau)h(t-\tau)d\tau = \int_{-\infty}^{\infty} u(\tau-1)e^{-(t-\tau)}u(t-\tau)d\tau$$

$$= \int_1^t e^{-t}e^{\tau}d\tau \quad \text{if } t \geq 1$$

$$= e^{-t}e^{\tau} \Big|_1^t = e^{-t}(e^t - e)$$

$$\Rightarrow y(t) = (1 - e^{-t+1})u(t-1)$$

Note: integral
is zero if $t < 1$