(128) $y(t) = (x*h)(t)$, $x(t) = u(t)$, $h(t) = e^{-t}u(t)$

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

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

$\tau \geq 0$, $t - \tau \geq 0 \rightarrow \tau \leq t$

$$\Rightarrow y(t) = \int_0^t e^{-(t-\tau)}\,d\tau$$

$$\Rightarrow y(t) = e^{-t}\int_0^t e^{\tau}\,d\tau \rightarrow e^t - 1$$

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

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

(130) $y(t) = (x*h)(t)$, $x(t) = e^{-t}u(t)$, $h(t) = u(t)$

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

$0 \leq \tau \leq t$

$$y(t) = \int_0^t e^{-\tau}\,d\tau = 1 - e^{-t}$$

$t > 0$

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

$y(t) = \begin{cases} 1 - e^{-t}, & t > 0 \\ 0, & t < 0 \end{cases}$

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

$\rightarrow x*h = h*x$, $\lambda = t - \tau$, $\Rightarrow \tau = t - \lambda$, $\rightarrow d\tau = -d\lambda$

$$\Rightarrow (x*h)(t) = \int_{-\infty}^{\infty} x(t-\lambda)h(\lambda)\,d\lambda$$

$$\Rightarrow (x*h)(t) = \int_{-\infty}^{\infty} h(\lambda)x(t-\lambda)\,d\lambda = (h*x)(t)$$

$$\Rightarrow (x*h)(t) = (h*x)(t)$$

(131) $y(t) = (x*h)(t)$, $x(t) = \delta(t-1)$, $h(t) = e^{-t}u(t)$

$$y(t) = h(t-1) = e^{-(t-1)}u(t-1)$$

$h(t)$ $\delta(t)$

(139) $x[n] = \{1, 2, 1\}$, $n = 0, 1, 2$

$y[n] = \{1, 1\}$, $n = 0, 1$

$$R_{xy}[m] = \sum_{n=-\infty}^{\infty} x[n]y[n-m]$$

$n_{min} = n_{min,y} - n_{max,x} = 0 - 2 = -2$

$n_{max} = n_{max,y} - n_{min,x} = 1 - 0 = 1$

$m: -2, -1, 0, 1$

$m = -2 \Rightarrow R_{xy}[-2] = 1$

$m = -1 \Rightarrow R_{xy}[-1] = 3$

$m = 0 \Rightarrow R_{xy}[0] = 3$

$m = 1 \Rightarrow R_{xy}[1] = 1$

$$\Rightarrow R_{xy}[m] = \{1, 3, 3, 1\}$$

(3.9) $$R_{xy}[m] = \sum_{n=-\infty}^{\infty} x[n]y[n+m]$$

$y^-[n] = y[-n]$

$\Rightarrow y[m-n] = y[n-m]$

$R_{xy}[m] = (x*y^-)[m]$

$$(x*y^-)[m] = \sum_{n=-\infty}^{\infty} x[n]y^-[m-n] =$$

$$(x*y^-)[m] = \sum_{n=-\infty}^{\infty} x[n]y[n-m] = R_{xy}[-m]$$

$$R_{xy}[m] = (x*y^-)[-m]$$

(3.6) $$R_{xy}(\tau) = \int_{-\infty}^{\infty} x(t)y(t+\tau)\,dt$$

$(\lambda) = t + \tau$