

Convolution Sums

No.	$f_1[k]$	$f_2[k]$	$f_1[k] * f_2[k] = f_2[k] * f_1[k]$
1	$\delta[k-j]$	$f[k]$	$f[k-j]$
2	$\gamma^k u[k]$	$u[k]$	$\left[\frac{1-\gamma^{k+1}}{1-\gamma} \right] u[k]$
3	$u[k]$	$u[k]$	$(k+1)u[k]$
4	$\gamma_1^k u[k]$	$\gamma_2^k u[k]$	$\left[\frac{\gamma_1^{k+1} - \gamma_2^{k+1}}{\gamma_1 - \gamma_2} \right] u[k] \quad \gamma_1 \neq \gamma_2$
5	$\gamma_1^k u[k]$	$\gamma_2^k u[-(k+1)]$	$\frac{\gamma_1}{\gamma_2 - \gamma_1} \gamma_1^k u[k] + \frac{\gamma_2}{\gamma_2 - \gamma_1} \gamma_2^k u[-(k+1)] \quad \gamma_2 > \gamma_1 $
6	$k\gamma_1^k u[k]$	$\gamma_2^k u[k]$	$\frac{\gamma_1 \gamma_2}{(\gamma_1 - \gamma_2)^2} \left[\gamma_2^k - \gamma_1^k + \frac{\gamma_1 - \gamma_2}{\gamma_2} k \gamma_1^k \right] u[k] \quad \gamma_1 \neq \gamma_2$
7	$ku[k]$	$ku[k]$	$\frac{1}{6} k(k-1)(k+1)u[k]$
8	$\gamma^k u[k]$	$\gamma^k u[k]$	$(k+1)\gamma^k u[k]$
9	$\gamma^k u[k]$	$ku[k]$	$\left[\frac{\gamma(\gamma^k - 1) + k(1-\gamma)}{(1-\gamma)^2} \right] u[k]$
10	$ \gamma_1 ^k \cos(\beta k + \theta) u[k]$	$\gamma_2^k u[k]$	$\frac{1}{R} \left[\gamma_1 ^{k+1} \cos[\beta(k+1) + \theta - \phi] - \gamma_2^{k+1} \cos(\theta - \phi) \right] u[k] \quad \gamma_2 \text{ real}$ $R = \left[\gamma_1 ^2 + \gamma_2^2 - 2 \gamma_1 \gamma_2 \cos \beta \right]^{1/2}$ $\phi = \tan^{-1} \left[\frac{(\gamma_1 \sin \beta)}{(\gamma_1 \cos \beta - \gamma_2)} \right]$