

*Equation of Laplace Transform & Z-transform

Laplace Transform	Time Function	Z-transform
1	Unit impulse $\delta(t)$	1
$\frac{1}{s}$	Unit step $u_s(t)$	$\frac{z}{z-1}$
$\frac{1}{1-e^{-Ts}}$	$\delta_T(t) = \sum_{n=0}^{\infty} \delta(t-nT)$	$\frac{z}{z-1}$
$\frac{1}{s^2}$	t	$\frac{Tz}{(z-1)^2}$
$\frac{1}{s^3}$	$\frac{t^2}{2}$	$\frac{T^2 z(z+1)}{2(z-1)^3}$
$\frac{1}{s^{n+1}}$	$\frac{t^n}{n!}$	$\lim_{\alpha \rightarrow 0} \frac{(-1)^n}{n!} \frac{\partial^n}{\partial \alpha^n} \left[\frac{z}{z-e^{-\alpha T}} \right]$
$\frac{1}{s+\alpha}$	$e^{-\alpha t}$	$\frac{z}{z-e^{-\alpha T}}$
$\frac{1}{(s+\alpha)^2}$	$te^{-\alpha t}$	$\frac{Tze^{-\alpha T}}{(z-e^{-\alpha T})^2}$
$\frac{\alpha}{s(s+\alpha)}$	$1-e^{-\alpha t}$	$\frac{(1-e^{-\alpha T})z}{(z-1)(z-e^{-\alpha T})}$
$\frac{\omega}{s^2+\omega^2}$	$\sin \omega t$	$\frac{z \sin \omega T}{z^2 - 2z \cos \omega T + 1}$

$\frac{\omega}{(s + \alpha)^2 + \omega^2}$	$e^{-\alpha t} \sin \omega t$	$\frac{ze^{-\alpha t} \sin \omega T}{z^2 - 2ze^{-\alpha T} \cos \omega T + e^{-2\alpha T}}$
$\frac{s}{s^2 + \omega^2}$	$\cos \omega t$	$\frac{z(z - \cos \omega T)}{z^2 - 2z \cos \omega T + 1}$
$\frac{s + \alpha}{(s + \alpha)^2 + \omega^2}$	$e^{-\alpha t} \cos \omega t$	$\frac{z^2 - ze^{-\alpha T} \cos \omega T}{z^2 - 2ze^{-\alpha T} \cos \omega T + e^{-2\alpha T}}$