3.1 Table of Laplace transforms

Table 3.1: Common Laplace Transforms.

Name	$f(t)$	$F(s)$
Unit impulse	$\delta(t)$	1
Unit step	$u(t)$	$\dfrac{1}{s}$
Unit ramp	t	$\dfrac{1}{s^2}$
nth-order ramp	t^n	$\dfrac{n!}{s^{n+1}}$
Exponential	e^{-at}	$\dfrac{1}{s+a}$
nth-order exponential	$t^n e^{-at}$	$\dfrac{n!}{(s+a)^{n+1}}$
Sine	$\sin \omega t$	$\dfrac{\omega}{s^2+\omega^2}$
Cosine	$\cos \omega t$	$\dfrac{s}{s^2+\omega^2}$
Damped sine	$e^{-at}\sin \omega t$	$\dfrac{\omega}{(s+a)^2+\omega^2}$
Damped cosine	$e^{-at}\cos \omega t$	$\dfrac{s+a}{(s+a)^2+\omega^2}$
Diverging sine	$t\sin \omega t$	$\dfrac{2\omega s}{\left(s^2+\omega^2\right)^2}$
	$A\sin \omega t$	$\dfrac{A\omega}{s^2+\omega^2}$
Diverging cosine	$t\cos \omega t$	$\dfrac{s^2-\omega^2}{\left(s^2+\omega^2\right)^2}$
	$e^{-\zeta\omega_n t}\sin\left[\omega_n\left(1-\zeta^2\right)^{1/2}t\right];\zeta<1$	$\dfrac{\omega_n\left(1-\zeta^2\right)^{1/2}}{s^2+2\zeta\omega_n s+\omega_n^{\,2}}$
	$1-e^{-\zeta\omega_n t}\left(1-\zeta^2\right)^{-1/2}\times\sin\left[\omega_n\left(1-\zeta^2\right)^{1/2}t+\phi\right]$	$\dfrac{\omega_n^{\,2}}{s\left(s^2+2\zeta\omega_n s+\omega_n^{\,2}\right)}$