

# Laplace Transforms

$f(t)$	$F(s)$
1	$\frac{1}{s}$
$e^{at}$	$\frac{1}{s-a}$
$t^n$	$\frac{n!}{s^{n+1}}$
$\sin bt$	$\frac{b}{s^2 + b^2}$
$\cos bt$	$\frac{s}{s^2 + b^2}$
$e^{at}f(t)$	$F(s-a)$

$f(t)$	$F(s)$
$f'(t)$	$sF(s) - f(0)$
$tf(t)$	$-\frac{dF}{ds}$
$u(t-a)f(t-a)^1$	$e^{-as}F(s)$
$f * g(t)$	$F(s)G(s)$
$\alpha f(t) + g(t)$	$\alpha F(s) + G(s)$
$\delta(t-a)^*$	$e^{-as}$

The convolution of a function  $f$  with a function  $g$  (this assumes that both  $f$  and  $g$  are zero for  $t < 0$ ) is defined as

$$f * g(t) = \int_0^t f(t-\tau)g(\tau) d\tau.$$

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<sup>1</sup> The function  $u(t)$  is the Heaviside function, and  $u(t-a) = u_a(t)$ .

\*  $\delta(t)$  is the Dirac delta function.