

# Table of Laplace Transform Properties

[Laplace and Z Transforms](#)
[Laplace Properties](#)
[Z Xform Properties](#)
[Link to shortened 2-page pdf of Laplace Transforms and Properties](#)

Property Name	Illustration
Definition	$f(t) \xleftrightarrow{\mathcal{L}} F(s)$ $F(s) = \int_0^{\infty} f(t)e^{-st}dt$
Linearity	$Af_1(t) + Bf_2(t) \xleftrightarrow{\mathcal{L}} AF_1(s) + BF_2(s)$
First Derivative	$\frac{df(t)}{dt} \xleftrightarrow{\mathcal{L}} sF(s) - f(0^-)$
Second Derivative	$\frac{d^2f(t)}{dt^2} \xleftrightarrow{\mathcal{L}} s^2F(s) - sf(0^-) - \dot{f}(0^-)$
n <sup>th</sup> Derivative	$\frac{d^nf(t)}{dt^n} \xleftrightarrow{\mathcal{L}} s^nF(s) - \sum_{i=1}^n s^{n-i}f^{(i-1)}(0^-)$
Integration	$\int_0^t f(\lambda)d\lambda \xleftrightarrow{\mathcal{L}} \frac{1}{s}F(s)$
Multiplication by time	$tf(t) \xleftrightarrow{\mathcal{L}} -\frac{dF(s)}{ds}$
Time Shift	$f(t-a)\gamma(t-a) \xleftrightarrow{\mathcal{L}} e^{-as}F(s)$ <p>(<math>\gamma(t)</math> = unit step function)</p>
Complex Shift	$f(t)e^{-at} \xleftrightarrow{\mathcal{L}} F(s+a)$
Time Scaling	$f\left(\frac{t}{a}\right) \xleftrightarrow{\mathcal{L}} aF(as)$
Convolution (** denotes convolution of functions)	$f_1(t) * f_2(t) \xleftrightarrow{\mathcal{L}} F_1(s)F_2(s)$
Initial Value Theorem	$\lim_{t \rightarrow 0^+} f(t) = \lim_{s \rightarrow \infty} sF(s)$
Final Value Theorem	$\lim_{t \rightarrow \infty} f(t) = \lim_{s \rightarrow 0} sF(s)$

[References](#)

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