Properties of The Laplace Transform

Property	Signal	Laplace Transform
	$x(t)$	$X(s)$
	$x_1(t)$	$X_1(s)$
	$x_2(t)$	$X_2(s)$
Linearity Time shifting Shifting in the s-Domain	$ax_1(t)+bx_2(t)$ $x(t-t_0)$ $e^{s_0 t}x(t)$	$aX_1(s)+bX_2(s)$ $e^{-s_0 t}X(s)$ $X(s-s_0)$
Time scaling	$x(at)$	$\frac{1}{\lvert a \rvert}X(\frac{s}{a})$
Conjugation Convolution	$x^*(t)$ $x_1(t)*x_2(t)$	$X^*(s^*)$ $X_1(s)X_2(s)$
Differentiation in the Time Domain	$\frac{d}{dt}x(t)$	$sX(s)$
Differentiation in the s-Domain	$-tx(t)$	$\frac{d}{ds}X(s)$
Integration in the Time Domain	$\int_{-\infty}^{t} x(\tau)d(\tau)$	$\frac{1}{s}X(s)$

Initial- and Final- Value Theorems

If $x(t)=0$ for $t<0$ and $x(t)$ contains no impulses or higher-order singularities at $t=0$, then

$$x(0^+) = \lim_{x \to \infty} sX(s)$$

$$\lim_{t \to \infty} x(t) = \lim_{s \to 0} sX(s)$$