Table 1: Table of Laplace Transforms

Number	$f(t)$	$F(s)$
1	$\delta(t)$	1
2	$u_s(t)$	$\frac{1}{s}$
3	t	$\frac{1}{s^2}$
4	t^n	$\frac{n!}{s^{n+1}}$
5	e^{-at}	$\frac{1}{(s+a)}$
6	te^{-at}	$\frac{1}{(s+a)^2}$
7	$\frac{1}{(n-1)!}t^{n-1}e^{-at}$	$\frac{1}{(s+a)^n}$
8	$1 - e^{-at}$	$\frac{a}{s(s+a)}$
9	$e^{-at} - e^{-bt}$	$\frac{b-a}{(s+a)(s+b)}$
10	$be^{-bt} - ae^{-at}$	$\frac{(b-a)s}{(s+a)(s+b)}$
11	$\sin at$	$\frac{a}{s^2+a^2}$
12	$\cos at$	$\frac{s}{s^2+a^2}$
13	$e^{-at}\cos bt$	$\frac{s+a}{(s+a)^2+b^2}$
14	$e^{-at}\sin bt$	$\frac{b}{(s+a)^2+b^2}$
15	$1 - e^{-at}(\cos bt + \frac{a}{b}\sin bt)$	$\frac{a^2+b^2}{s[(s+a)^2+b^2]}$

Table 1: Properties of Laplace Transforms

Number	Time Function	Laplace Transform	Property
1	$\alpha f_1(t) + \beta f_2(t)$	$\alpha F_1(s) + \beta F_2(s)$	Superposition
2	$f(t-T)u_s(t-T)$	$F(s)e^{-sT}; \ \ T \geq 0$	Time delay
3	$f(at)$	$\dfrac{1}{a}F(\dfrac{s}{a}); \ \ a > 0$	Time scaling
4	$e^{-at}f(t)$	$F(s+a)$	Shift in frequency
5	$\dfrac{df(t)}{dt}$	$sF(s) - f(0^-)$	First-order differentiation
6	$\dfrac{d^2 f(t)}{dt^2}$	$s^2 F(s) - sf(0^-) - f^{(1)}(0^-)$	Second-order differentiation
7	$f^n(t)$	$s^n F(s) - s^{n-1}f(0) - s^{n-2}f^{(1)}(0) - ... - f^{(n-1)}(0)$	n^{th}-order differentiation
6	$\displaystyle\int_{0^-}^{t} f(\zeta)d\zeta$	$\dfrac{1}{s}F(s)$	Integration
7	$f(0^+)$	$\displaystyle\lim_{s\to\infty} sF(s)$	Post-initial value theorem
8	$\displaystyle\lim_{t\to\infty} f(t)$	$\displaystyle\lim_{s\to 0} sF(s)$	Final value theorem
9	$tf(t)$	$-\dfrac{dF(s)}{ds}$	Multiplication by time