

Function	Laplace Transform	Domain Restrictions
Elementary Functions		
1. $\delta(t)$, impulse	1	
2. $\delta(t - \tau)$, shifted impulse	$e^{-s\tau}$	τ real
3. $1(t)$, step	$\frac{1}{s}$	$\text{Re}(s) > 0$
4. $t^n 1(t)$, ramp	$\frac{n!}{s^{n+1}}$	$\text{Re}(s) > 0$
5. $e^{-at} 1(t)$, exponential	$\frac{1}{s+a}$	$\text{Re}(s) > -\text{Re}(a)$
6. $\cos(bt) 1(t)$	$\frac{s}{s^2 + b^2}$	$\text{Re}(s) > 0$, b real
7. $\sin(bt) 1(t)$	$\frac{b}{s^2 + b^2}$	$\text{Re}(s) > 0$, b real
8. $e^{-at} \cos(bt) 1(t)$	$\frac{s+a}{(s+a)^2 + b^2}$	$\text{Re}(s) > -a$, a, b real
9. $e^{-at} \sin(bt) 1(t)$	$\frac{b}{(s+a)^2 + b^2}$	$\text{Re}(s) > -a$, a, b real
10. $t^n e^{-at} 1(t)$	$\frac{n!}{(s+a)^{n+1}}$	$\text{Re}(s) > -\text{Re}(a)$
11. $\frac{t^{n-1}}{(n-1)!} e^{-at} 1(t)$	$\frac{1}{(s+a)^n}$	$\text{Re}(s) > -\text{Re}(a)$
Laplace-Transform Properties		
12. $f(t)e^{-at} 1(t)$	$F(s+a)$	$F(s) = L\{f(t) 1(t)\}$
13. $(af(t) + bg(t)) 1(t)$	$aF(s) + bG(s)$	$F(s) = L\{f(t) 1(t)\}$ $G(s) = L\{g(t) 1(t)\}$
14. $f(t - \tau) 1(t - \tau)$	$e^{-s\tau} F(s)$	τ real
15. $\frac{df}{dt}$	$sF(s) - f(0^+)$	$F(s) = L\{f(t) 1(t)\}$, $f(t)$ is differentiable for $t > 0$
Table 7.2. Table of Laplace Transforms		