Table 1: **A Brief Table Of Laplace Transform Pairs**

$f(t)$, $t \geq 0$	Laplace Transform $F(s)$	
1. $h(t) = \begin{cases} 1 & t \geq 0 \\ 0, & t < 0 \end{cases}$	$\dfrac{1}{s}$	$(s > 0)$
2. 1	$\dfrac{1}{s}$	$(s > 0)$
3. $t^n, \qquad n = 1, 2, 3, \ldots$	$\dfrac{n!}{s^{n+1}}$	$(s > 0)$
4. $e^{\alpha t}$	$\dfrac{1}{s - \alpha}$	$(s > \alpha)$
5. $\sin \omega t$	$\dfrac{\omega}{s^2 + \omega^2}$	$(s > 0)$
6. $\cos \omega t$	$\dfrac{s}{s^2 + \omega^2}$	$(s > 0)$
7. $\sinh bt = \dfrac{e^{bt} - e^{-bt}}{2}$	$\dfrac{b}{s^2 - b^2}$	$(s > \lvert b \rvert)$
8. $\cosh bt = \dfrac{e^{bt} + e^{-bt}}{2}$	$\dfrac{s}{s^2 - b^2}$	$(s > \lvert b \rvert)$
9. $e^{\alpha t} f(t)$, with $\lvert f(t) \rvert \leq M e^{at}$	$F(s - \alpha)$	$s > \alpha + a$
(10) - (13) are four special cases of (9)		
10. $e^{\alpha t} h(t)$	$\dfrac{1}{s - \alpha}$	$(s > \alpha)$
11. $e^{\alpha t} t^n, \qquad n = 1, 2, 3, \ldots$	$\dfrac{n!}{(s - \alpha)^{n+1}}$	$(s > \alpha)$
12. $e^{\alpha t} \sin \omega t$	$\dfrac{\omega}{(s - \alpha)^2 + \omega^2}$	$(s > \alpha)$
13. $e^{\alpha t} \cos \omega t$	$\dfrac{s - \alpha}{(s - \alpha)^2 + \omega^2}$	$(s > \alpha)$
14. $f(t - \alpha) h(t - \alpha), \qquad (\alpha \geq 0)$, with $\lvert f(t) \rvert \leq M e^{at}$	$e^{-\alpha s} F(s)$	$(s > a)$
15. $h(t - \alpha), \qquad \alpha \geq 0$	$\dfrac{e^{-\alpha s}}{s}$	$(s > 0)$
16. $f'(t)$, with $f(t)$ continuous with $\lvert f'(t) \rvert \leq M e^{at}$	$sF(s) - f(0)$	$s > \max\{a, 0\}$
17. $f''(t)$, with $f'(t)$ continuous with $\lvert f''(t) \rvert \leq M e^{at}$	$s^2 F(s) - sf(0) - f'(0)$	$s > \max\{a, 0\}$

18. $f^{(n)}(t)$, with $f^{(n-1)}(t)$ continuous with $\lvert f^{(n)}(t)\rvert \le Me^{at}$	$s^nF(s) - s^{n-1}f(0) - \cdots$ $-sf^{(n-2)} - f^{(n-1)}(0)$	$s > \max\{a, 0\}$
19. $\displaystyle\int_0^t f(u)\,du$, with $\lvert f^{(n)}(t)\rvert \le Me^{at}$	$\dfrac{F(s)}{s}$	$s > \max\{a, 0\}$
20. $\displaystyle\int_0^t f(t-\lambda)g(\lambda)\,d\lambda$	$F(s)\cdot G(s)$	
21. $t\cos\omega t$	$\dfrac{s^2-\omega^2}{(s^2+\omega^2)^2}$	$(s > 0)$
22. $t\sin\omega t$	$\dfrac{2\omega s}{(s^2+\omega^2)^2}$	$(s > 0)$
23. $\sin\omega t - \omega t\cos\omega t$	$\dfrac{2\omega^3}{(s^2+\omega^2)^2}$	$(s > 0)$
24. $\omega t - \sin\omega t$	$\dfrac{\omega^3}{s^2(s^2+\omega^2)^2}$	$(s > 0)$
25. $tf(t)$	$-F'(s)$	
26. $t^kf(t)$	$(-1)^kF^{(k)}(s)$	
27. $\delta(t-a)$	e^{-as}	$(s > 0)$

For Periodic Functions:

Let $f(t)$ be a piecewise continuous periodic function defined on $0 \le t < \infty$, where $f(t)$ has period T. Then

$$\mathcal{L}\{f(t)\} = \frac{\displaystyle\int_0^T e^{-st}f(t)\,dt}{1-e^{-sT}}, \qquad s > 0$$

Convolution

$$(f * g)(t) = \int_0^t f(t-\lambda)g(\lambda)\,d\lambda$$

$$(f * g)(t) = \mathcal{L}^{-1}\{F(s)G(s)\}$$