Table of Laplace Transforms

$$f(t)$$
 $\mathcal{L}[f(t)] = F(s)$ $f(t)$ $\mathcal{L}[f(t)] = F(s)$

$$\frac{1}{s} \qquad \qquad (1) \qquad \frac{ae^{at} - be^{bt}}{a - b} \qquad \frac{s}{(s - a)(s - b)} \qquad (19)$$

$$\frac{\mathcal{U}(t-a)}{s} \qquad \qquad (3) \qquad \qquad \frac{n!}{(s-a)^{n+1}} \qquad (21)$$

$$\frac{f(t-a)\mathcal{U}(t-a)}{s} \qquad \qquad (4)$$

$$\frac{\delta(t)}{\delta(t)} \qquad \qquad \frac{k}{(s-a)^2 + k^2} \qquad \qquad (22)$$

$$\delta(t - t_0)$$
 e^{-st_0} (6) $e^{at} \cos kt$ $\frac{s - a}{(s - a)^2 + k^2}$ (23)

$$t^{n}f(t) \qquad (-1)^{n}\frac{d^{n}F(s)}{ds^{n}} \qquad (7)$$

$$e^{at}\sinh kt \qquad \frac{k}{(s-a)^{2}-k^{2}} \qquad (24)$$

$$f'(t)$$
 $sF(s) - f(0)$ (8)
$$f^{n}(t)$$
 $s^{n}F(s) - s^{(n-1)}f(0) - e^{at}\cosh kt$ $\frac{s-a}{(s-a)^{2}-k^{2}}$ (25)

$$\cdots - f^{(n-1)}(0) \tag{9}$$

$$t \sin kt \qquad \frac{2ks}{(2+t^2)^2} \tag{26}$$

$$\int_{0}^{t} f(x)g(t-x)dx \qquad F(s)G(s) \tag{10}$$

$$t\cos kt \qquad \frac{s^{2}-k^{2}}{(s^{2}+k^{2})^{2}} \tag{27}$$

$$t^{n} \ (n = 0, 1, 2, \dots)$$
 $\frac{n!}{s^{n+1}}$ (11)
$$t \sinh kt \qquad \frac{2ks}{(s^{2} - k^{2})^{2}}$$
 (28)

$$t^{x} (x \ge -1 \in \mathbb{R}) \qquad \frac{\Gamma(x+1)}{s^{x+1}} \tag{12}$$

$$\frac{s^{x+1}}{s^{x+1}} \qquad (12)$$

$$t \cosh kt \qquad \frac{s^2 + k^2}{(s^2 - k^2)^2} \qquad (29)$$

$$\sinh kt \qquad \frac{k}{(3)} \qquad (13)$$

$$\frac{s^2 + k^2}{s} \qquad \frac{\sin at}{t} \qquad \arctan \frac{a}{s} \qquad (30)$$

$$\frac{1}{e^{at}} \qquad \frac{1}{\sqrt{\pi t}} e^{-a^2/4t} \qquad \frac{e^{-a\sqrt{s}}}{\sqrt{s}}$$

$$(31)$$

$$\frac{a}{2\sqrt{\pi t^3}}e^{-a^2/4t} \qquad e^{-a\sqrt{s}} \tag{32}$$

$$\frac{s}{e^2 - k^2} \qquad (17) \qquad \operatorname{erfc}\left(\frac{a}{2\sqrt{t}}\right) \qquad \frac{e^{-a\sqrt{s}}}{s} \qquad (33)$$

$$\frac{e^{at} - e^{bt}}{a - b} \qquad \frac{1}{(s - a)(s - b)} \tag{18}$$