

basic Laplace

| f | $F = Lf$ | F | $f = L^{-1}F$ |
|----------------|----------------------------------------------------|--------------------------|----------------------------------------|
| 1 | $\frac{1}{s}$ | $\frac{1}{s-a}$ | e^{at} |
| t | $\frac{1}{s^2}$ | $\frac{1}{(s-a)^2}$ | te^{at} |
| t^2 | $\frac{2}{s^3}$ | $\frac{2}{(s-a)^3}$ | t^2e^{at} |
| t^n | $\frac{n!}{s^{n+1}}$ | $\frac{n!}{(s-a)^{n+1}}$ | $t^n e^{at}$ |
| $u(t-c)f(t-c)$ | $F(s)e^{-sc}$ | $F(s+c)$ | $f(t)e^{-ct}$ |
| $u(t-7)(t-7)$ | $\frac{1}{s^2}e^{-7s}$ | $\frac{1}{(s+7)^2}$ | te^{-7t} |
| $f(ct)$ | $\frac{1}{c}F\left(\frac{s}{c}\right)$ | $F(cs)$ | $\frac{1}{c}f\left(\frac{t}{c}\right)$ |
| $3t$ | $\frac{1}{3} \frac{1}{\left(\frac{s}{3}\right)^2}$ | $\frac{1}{(3s)^2}$ | $\frac{1}{3} \left(\frac{t}{3}\right)$ |

diff Laplace

| f | $F = Lf$ | F | $f = L^{-1}F$ |
|--------------|----------------------------------|---------------------|-------------------|
| 1 | $\frac{1}{s}$ | $\frac{1}{s-a}$ | e^{at} |
| t | $\frac{1}{s^2}$ | $\frac{1}{(s-a)^2}$ | te^{at} |
| t^2 | $\frac{2}{s^3}$ | $\frac{2}{(s-a)^3}$ | t^2e^{at} |
| $f'(t)$ | $sF(s) - f(0)$ | $F'(s)$ | $-tf(t)$ |
| 1 | $s\frac{1}{s^2} - 0$ | $-2\frac{1}{s^3}$ | $-t \cdot t$ |
| $f''(t)$ | $s^2F(s) - sf(0) - f'(0)$ | | |
| $f^{(n)}(t)$ | $s^n F(s) - s^{n-1}f(0) - \dots$ | | |
| $tf(t)$ | $-F'(s)$ | $F'(s)$ | $-tf(t)$ |
| $t^n f(t)$ | $(-1)^n F^{(n)}(s)$ | $F^{(n)}(s)$ | $(-1)^n t^n f(t)$ |

int Laplace

| f | $F = Lf$ | F | $f = L^{-1}F$ |
|---------------------------------------|------------------|----------------------------------------------------------|------------------|
| 1 | $\frac{1}{s}$ | $\frac{1}{s-a}$ | e^{at} |
| t | $\frac{1}{s^2}$ | $\frac{1}{(s-a)^2}$ | te^{at} |
| t^2 | $\frac{2}{s^3}$ | $\frac{2}{(s-a)^3}$ | t^2e^{at} |
| $\int_0^t f(\tau) d\tau$ | $\frac{F(s)}{s}$ | $\int_s^\infty F(\sigma) d\sigma$ | $\frac{f(t)}{t}$ |
| $\int_0^t \tau d\tau = \frac{t^2}{2}$ | $\frac{1}{s^2}$ | $\int_s^\infty \frac{1}{\sigma^2} d\sigma = \frac{1}{s}$ | $\frac{t}{t}$ |

mix Laplace

| | | | |
|----------------------|-----------------------------------------------------------|-------------------|------------------------------------------------------------------|
| f | $F = Lf$ | F | $f = L^{-1}F$ |
| $f(t)$ | $\int_0^{\infty} e^{-st} f(t) dt$ | $F(s)$ | $\frac{1}{2\pi} \int_{-\infty}^{+\infty} e^{(x+iy)t} F(x+iy) dy$ |
| $f * g$ | $F(s) \cdot G(s)$ | $F(s) \cdot G(s)$ | $\int_0^t f(\tau)g(t-\tau) d\tau$ |
| $f(t)$ | $\frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t) dt$ | period T | |
| $\sin(t)$ | $\frac{1}{1-e^{-s2\pi}} \int_0^{2\pi} e^{-st} \sin(t) dt$ | period 2π | |
| $e^{at} f(t)$ | $F(s-a)$ | | |
| $e^{at} f(t)$ | $F(s-a)$ | | |
| $\frac{1}{\sqrt{t}}$ | $\sqrt{\frac{\pi}{s}}$ | | |
| $a^{[t]}$ | $\frac{1-e^{-s}}{s(1-ae^{-s})}$ | | |

sin & sinh Laplace

| f | $F = Lf$ | F | $f = L^{-1}F$ |
|-----------------------|----------------------------|---------------------------------|---------------------------------|
| $\frac{\sin bt}{b}$ | $\frac{1}{s^2 + b^2}$ | $\frac{1}{(s - a)^2 + b^2}$ | $e^{at} \frac{\sin bt}{b}$ |
| $\cos bt$ | $\frac{s}{s^2 + b^2}$ | $\frac{s - a}{(s - a)^2 + b^2}$ | $e^{at} \cos bt$ |
| $\frac{\sinh bt}{b}$ | $\frac{1}{s^2 - b^2}$ | $\frac{1}{(s - a)^2 - b^2}$ | $e^{at} \frac{\sinh bt}{b}$ |
| $\cosh bt$ | $\frac{s}{s^2 - b^2}$ | $\frac{s - a}{(s - a)^2 - b^2}$ | $e^{at} \cosh bt$ |
| $t \frac{\sin bt}{b}$ | $\frac{2s}{(s^2 + b^2)^2}$ | $\frac{2b^2}{(s^2 + b^2)^2}$ | $\frac{\sin bt}{b} - t \cos bt$ |

δ Laplace

| f | $F = Lf$ | F | $f = L^{-1}F$ |
|-----------------------|---------------|---------------|-----------------------|
| $\delta(t)$ | 1 | 1 | $\delta(t)$ |
| $\delta'(t)$ | s | s | $\delta'(t)$ |
| $\delta''(t)$ | s^2 | s^2 | $\delta''(t)$ |
| $\delta^{(n)}(t)$ | s^n | s^n | $\delta^{(n)}(t)$ |
| $\delta^{(n)}(t - c)$ | $s^n e^{-sc}$ | $s^n e^{-sc}$ | $\delta^{(n)}(t - c)$ |