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### One-sided Laplace Table:

| $f(t)$ | $F(s) = \mathscr{L}\{f\}(s)$ | ROC |
|---|---|---|
| 1. $1$ | $\frac{1}{s}$ | $\mathrm{Re}(s) > 0$ |
| 2. $t$ | $\frac{1}{s^2}$ | $\mathrm{Re}(s) > 0$ |
| 3. $t^n$ | $\frac{n!}{s^{n+1}}$ | $\mathrm{Re}(s) > 0$ |
| 4. $\sin(\omega t)$ | $\frac{\omega}{s^2+\omega^2}$ | $\mathrm{Re}(s) > 0$ |
| 5. $\cos(\omega t)$ | $\frac{s}{s^2+\omega^2}$ | $\mathrm{Re}(s) > 0$ |
| 6. $\sinh(\omega t)$ | $\frac{\omega}{s^2-\omega^2}$ | $\mathrm{Re}(s) > \lvert\omega\rvert$ |
| 7. $\cosh(\omega t)$ | $\frac{s}{s^2-\omega^2}$ | $\mathrm{Re}(s) > \lvert\omega\rvert$ |
| 8. $\delta^{(n)}(t)$ | $s^n$ | $\mathbb{C}$ |

### Algebraic Properties:

| | | |
|---|---|---|
| $\alpha f(t) + \beta g(t)$ | $\alpha F(s) + \beta G(s)$ | Linearity |
| $f(ct)$ | $\frac{1}{c}F\left(\frac{s}{c}\right)$ | Time Scaling |
| $e^{\alpha t} f(t)$ | $F(s-\alpha)$ | Exponential Modulation |
| $f(t-T)u(t-T)$ | $e^{-sT}\mathscr{L}\{f(t)u(t)\}$ | Time-Shifting |
| $t^n f(t)$ | $(-1)^n F^{(n)}(s)$ | Multiplication by $t^n$ |
| $(f * g)(t)$ | $F(s)G(s)$ | Convolution Theorem |
| $f^{(n)}(t)$ | $s^n F(s) - \sum_{k=1}^{n} s^{n-k} f^{(k-1)}(0)$ | |

### Fourier Series Formulas:

$$f(t) = \sum_{n=-\infty}^{\infty} c_n e^{\frac{2\pi n j t}{\tau}}, \qquad c_n = \langle f(t), e^{\frac{2\pi n j t}{\tau}} \rangle.$$

$$f(t) = \sum_{n=0}^{\infty} a_n \cos\left(\tfrac{2\pi n t}{\tau}\right), \qquad a_n = \begin{cases} \langle f(t), 1\rangle & n = 0 \\ 2\langle f(t), \cos\left(\frac{2\pi n t}{\tau}\right)\rangle & n > 0 \end{cases}.$$

$$f(t) = \sum_{n=1}^{\infty} s_n \sin\left(\tfrac{2\pi n t}{\tau}\right), \qquad s_n = 2\langle f(t), \sin\left(\tfrac{2\pi n t}{\tau}\right)\rangle.$$

$$\langle f(t), f(t)\rangle = \sum_{n=-\infty}^{\infty} |c_n|^2 = a_0^2 + \tfrac{1}{2}\sum_{n=1}^{\infty}(|a_n|^2 + |s_n|^2)$$

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