

General Properties

$$\begin{aligned}
\mathcal{L}\{a f(t) + b g(t)\} &= a \mathcal{L}\{f(t)\} + b \mathcal{L}\{g(t)\}, \\
\mathcal{L}\{f'(t)\} &= s \mathcal{L}\{f(t)\} - f(0), \\
\mathcal{L}\{f''(t)\} &= s^2 \mathcal{L}\{f(t)\} - s f(0) - f'(0), \dots \\
\mathcal{L}\{e^{at} f(t)\} &= F(s - a) \quad \text{if } F(s) = \mathcal{L}\{f(t)\}, \\
\mathcal{L}\{u(t - a) f(t - a)\} &= e^{-as} F(s) \quad \text{if } F(s) = \mathcal{L}\{f(t)\}. \\
\mathcal{L}\{f(t) * g(t)\} &= \mathcal{L}\{f(t)\} \mathcal{L}\{g(t)\}.
\end{aligned}$$

Some Special Transforms

$$\begin{aligned}
\mathcal{L}\{e^{at}\} &= \frac{1}{s - a} \quad (s > a), \\
\mathcal{L}\{\cos(bt)\} &= \frac{s}{s^2 + b^2} \quad (s > 0), \\
\mathcal{L}\{\sin(bt)\} &= \frac{b}{s^2 + b^2} \quad (s > 0), \\
\mathcal{L}\{\cosh(bt)\} &= \frac{s}{s^2 - b^2} \quad (s > |b|), \\
\mathcal{L}\{\sinh(bt)\} &= \frac{b}{s^2 - b^2} \quad (s > |b|), \\
\mathcal{L}\{1\} = \frac{1}{s}, \quad \mathcal{L}\{t\} = \frac{1}{s^2}, \quad \mathcal{L}\{t^2\} = \frac{2 \cdot 1}{s^3}, \quad \mathcal{L}\{t^3\} = \frac{3 \cdot 2 \cdot 1}{s^4} \quad (s > 0), \\
\mathcal{L}\{t^n\} &= \frac{n!}{s^{n+1}} \quad (s > 0) \text{ for any positive integer } n. \\
\mathcal{L}\{u(t - c)\} &= \frac{e^{-cs}}{s} \quad (s > 0).
\end{aligned}$$