Properties of Laplace Transform

- $\mathcal{L}(1) = \frac{1}{s}$
- $\mathcal{L}(t) = \frac{1}{s^2}$
- $\mathcal{L}(t^n) = \frac{n!}{s^{n+1}}$
- $\mathcal{L}(\sin(kt)) = \frac{k}{s^2+k^2}$
- $\mathcal{L}(\cos(kt)) = \frac{s}{s^2+k^2}$
- $\mathcal{L}(e^{at}) = \frac{1}{s-a}$
- $\mathcal{L}(te^{at}) = \frac{1}{(s-a)^2}$
- $\mathcal{L}(e^{at}f(t)) = F(s-a)$, where $F(s) = \mathcal{L}(f(t))$
- $\mathcal{L}(\mathcal{U}(t-a)) = \frac{e^{-as}}{s}$
- $\mathcal{L}(f(t-a)\mathcal{U}(t-a)) = e^{-as}F(s)$, where $F(s) = \mathcal{L}(f(t))$
- $\mathcal{L}(t^n f(t)) = (-1)^n \frac{d^n}{ds^n} F(s)$
- $\mathcal{L}(\int_0^t f(\tau)g(t-\tau)d\tau) = F(s)G(s)$, where $F(s) = \mathcal{L}(f(t))$, $G(s) = \mathcal{L}(g(t))$
- $\mathcal{L}(\int_0^t f(\tau)d\tau) = \frac{F(s)}{s}$, where $F(s) = \mathcal{L}(f(t))$
- $\mathcal{L}(\delta(t)) = 1$
- $\mathcal{L}(\delta(t-t_0)) = e^{-st_0}$
- $\mathcal{L}(f'(t)) = sF(s) - f(0)$, where $F(s) = \mathcal{L}(f(t))$
- $\mathcal{L}(f''(t)) = s^2F(s) - sf(0) - f'(0)$, where $F(s) = \mathcal{L}(f(t))$