

Laplace Transform

$$\mathcal{L}\{1\} = \frac{1}{s} \quad (s > 0)$$

$$\mathcal{L}\{e^{at}\} = \frac{1}{s-a} \quad (s > a)$$

$$\mathcal{L}\{t\} = \frac{1}{s^2}$$

$$\mathcal{L}\{t^2\} = \frac{2}{s^3}$$

$$\mathcal{L}\{t^3\} = \frac{3!}{s^4}$$

$$\mathcal{L}\{t^n\} = \frac{n!}{s^{n+1}} \quad (s > 0)$$

$$\mathcal{L}\{\sin at\} = \frac{a}{s^2 + a^2}$$

$$\mathcal{L}\{\cos at\} = \frac{s}{s^2 + a^2}$$

$$\mathcal{L}\{y'\} = sY(s) - y(0)$$

$$\mathcal{L}\{y''\} = s^2 Y(s) - sy(0) - y'(0)$$

$$\mathcal{L}\{y'''\} = s^3 Y(s) - s^2 y(0) - sy'(0) - y''(0)$$

$$\mathcal{L}\{e^{at} \sin bt\} = \frac{b}{(s-a)^2 + b^2}$$

$$\mathcal{L}\{e^{at} \cos bt\} = \frac{s-a}{(s-a)^2 + b^2}$$

$$\mathcal{L}\{t f(t)\} = -F'(s)$$

$$\mathcal{L}\{t^2 f(t)\} = F''(s)$$

$$\mathcal{L}\{t^3 f(t)\} = -F'''(s)$$

$$\mathcal{L}\{t^n f(t)\} = (-1)^n F^{(n)}(s)$$

$$\mathcal{L}\{e^{at} f(t)\} = F(s-a)$$

$$\mathcal{L}\{e^{at} \cdot t\} = \frac{1}{(s-a)^2}$$

$$\mathcal{L}\{e^{at} \cdot t^2\} = \frac{2}{(s-a)^3}$$

$$\mathcal{L}\{s \sin at\} = \frac{a}{s^2 - a^2}$$

$$\mathcal{L}\{s \cos at\} = \frac{s}{s^2 - a^2}$$