1 Chapter 6.1 & 6.2

$$\mathscr{L}[e^{at}] = \frac{1}{s-a}, \quad s > a$$

$$\mathscr{L}\left[\frac{dy}{dt}\right] = \mathscr{L}[y'] = s\mathscr{L}[y] - y(0)$$

$$\mathscr{L}[t] = \frac{1}{s^2}$$

$$\mathscr{L}[a] = \frac{a}{s}$$

$$\mathscr{L}[t^n] = \frac{n!}{s^{n+1}}$$

$$\mathscr{L}[\mu_a(t)] = \frac{e^{-as}}{s}$$

$$\mathscr{L}[\mu_a(t)f(t-a)] = e^{-as}\mathscr{L}[f(t)]$$

2 Chapter 6.3 & 6.4

$$\mathscr{L}\left[\frac{d^2y}{dt^2}\right] = \mathscr{L}[y''] = s^2\mathscr{L}[y] - sy(0) - y'(0)$$

$$\mathscr{L}[sin(\omega t)] = \frac{\omega}{s^2+\omega^2}$$

$$\mathscr{L}[cos(\omega t)] = \frac{s}{s^2+\omega^2}$$

$$\mathscr{L}[e^{at}sin(\omega t)] = \frac{\omega}{(s-a)^2+\omega^2}$$

$$\mathscr{L}[e^{at}cos(\omega t)] = \frac{s-a}{(s-a)^2+\omega^2}$$

$$\mathscr{L}[t^k f(t)] = -\frac{d^k F(t)}{ds^k} \qquad For\ F(s) = \mathscr{L}[f(t)]$$

$$\mathscr{L}[\delta_a(t)] = e^{-as}$$

$$\mathscr{L}[\delta(t)] = 1 \qquad No\ subscript\ implies\ a = 0$$

3 Appendix

General form for n$^{\text{th}}$ order derivative's Laplace transform

$$\textit{Recursive: } \mathscr{L}[y^n] = s\mathscr{L}[y^{(n-1)}] - y^{(n-1)}, \forall n \in \mathbb{Z}, n > 0$$

$$\textit{Summation: } \mathscr{L}[y^n] = s^n\mathscr{L}[y] - \sum_{k=0}^{n-1} s^{(n-1-k)} * y^k(0)$$

Laplace Image for a periodic function with period T

$$f(t+T) = f(t)\ \forall\ T\textit{: } \mathscr{L}[f(t)] = \frac{1}{1-e^{-Ts}} \int_0^T f(t)e^{-st}dt$$