MATH 2260 (Ordinary Differential Equations I)
Common Laplace Transforms

(a) $\mathcal{L}\{0\} = 0$

(b) $\mathcal{L}\{1\} = \dfrac{1}{s}$

(c) $\mathcal{L}\{e^{kt}\} = \dfrac{1}{s-k}$

(d) $\mathcal{L}\{\sin(kt)\} = \dfrac{k}{s^2+k^2}$

(e) $\mathcal{L}\{\cos(kt)\} = \dfrac{s}{s^2+k^2}$

(f) $\mathcal{L}\{t\} = \dfrac{1}{s^2}$

(g) $\mathcal{L}\{t^2\} = \dfrac{2}{s^3}$

(h) $\mathcal{L}\{\sinh(kt)\} = \dfrac{k}{s^2-k^2}$

(i) $\mathcal{L}\{\cosh(kt)\} = \dfrac{s}{s^2-k^2}$

(j) $\mathcal{L}\{u_c(t)\} = \dfrac{e^{-cs}}{s}$

(k) $\mathcal{L}\left\{\dfrac{dy}{dt}\right\} = s\mathcal{L}\{y\} - y(0)$

(ℓ) $\mathcal{L}\left\{\dfrac{d^2y}{dt^2}\right\} = s^2\mathcal{L}\{y\} - sy(0) - y'(0)$

In the following, $f(t)$ and $g(t)$ are functions for which $\mathcal{L}\{f(t)\} = F(s)$ and $\mathcal{L}\{g(t)\} = G(s)$.

(m) $\mathcal{L}\{kf(t)\} = kF(s)$ and $\mathcal{L}\{f(t)+g(t)\} = F(s)+G(s)$ (Linearity)

(n) $\mathcal{L}\{e^{\alpha t}f(t)\} = F(s-\alpha)$ (Shift Theorem)

(o) $\mathcal{L}\{u_c(t)f(t-c)\} = e^{-cs}F(s)$ (Step Function Theorem)