Brief Table of Integrals

$$\int x^n\,dx = \frac{1}{n+1}x^{n+1} + c, \quad n \neq -1$$
$$\int \frac{1}{x}\,dx = \ln|x| + c$$
$$\int u\,dv = uv - \int v\,du$$
$$\int e^x\,dx = e^x + c$$
$$\int a^x\,dx = \frac{1}{\ln a}a^x + c$$
$$\int \ln x\,dx = x\ln x - x + c$$
$$\int \sin x\,dx = -\cos x + c$$
$$\int \cos x\,dx = \sin x + c$$
$$\int \tan x\,dx = \ln|\sec x| + c$$
$$\int \sec x\,dx = \ln|\sec x + \tan x| + c$$
$$\int \sec^2 x\,dx = \tan x + c$$
$$\int \sec x \tan x\,dx = \sec x + c$$
$$\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\arctan\left(\frac{x}{a}\right) + c$$
$$\int \frac{1}{a^2-x^2}\,dx = \frac{1}{2a}\ln\left|\frac{x+a}{x-a}\right| + c$$
$$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \arcsin\left(\frac{x}{a}\right) + c$$
$$\int \frac{1}{x\sqrt{x^2-a^2}}\,dx = \frac{1}{a}\operatorname{arcsec}\left(\frac{x}{a}\right) + c$$
$$\int \frac{1}{\sqrt{x^2-a^2}}\,dx = \ln\left|x + \sqrt{x^2-a^2}\right| + c$$
$$\int \frac{1}{\sqrt{x^2+a^2}}\,dx = \ln\left|x + \sqrt{x^2+a^2}\right| + c$$
$$\int \sqrt{a^2-x^2}\,dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\arcsin\left(\frac{x}{a}\right) + c$$
$$\int \sqrt{x^2+a^2}\,dx = \frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\ln\left|x + \sqrt{x^2+a^2}\right| + c$$

Some Taylor Series

$$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n = 1 + x + x^2 + x^3 + \dots$$
$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$
$$\sin x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$
$$\cos x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$$
$$\tan^{-1} x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1} = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots$$
$$\ln(1+x) = \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n} = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$$
$$(1+x)^k = \sum_{n=0}^{\infty} \binom{k}{n} x^n = 1 + kx + \frac{k(k-1)}{2!}x^2 + \frac{k(k-1)(k-2)}{3!}x^3 + \dots$$

Table of Laplace Transforms

$$\mathcal{L}\{t^n\} = \frac{n!}{s^{n+1}}$$
$$\mathcal{L}\left\{t^{-1/2}\right\} = \frac{\sqrt{\pi}}{s^{1/2}}$$
$$\mathcal{L}\left\{t^{1/2}\right\} = \frac{\sqrt{\pi}}{2s^{3/2}}$$
$$\mathcal{L}\{t^\alpha\} = \frac{\Gamma(\alpha+1)}{s^{\alpha+1}}$$
$$\mathcal{L}\left\{e^{at}\right\} = \frac{1}{s-a}$$
$$\mathcal{L}\{\sin(kt)\} = \frac{k}{s^2+k^2}$$
$$\mathcal{L}\{\cos(kt)\} = \frac{s}{s^2+k^2}$$
$$\mathcal{L}\{\sinh(kt)\} = \frac{k}{s^2-k^2}$$
$$\mathcal{L}\{\cosh(kt)\} = \frac{s}{s^2-k^2}$$
$$\mathcal{L}\left\{te^{at}\right\} = \frac{1}{(s-a)^2}$$
$$\mathcal{L}\left\{t^n e^{at}\right\} = \frac{n!}{(s-a)^{n+1}}$$
$$\mathcal{L}\left\{e^{at}\sin(kt)\right\} = \frac{k}{(s-a)^2+k^2}$$
$$\mathcal{L}\left\{e^{at}\cos(kt)\right\} = \frac{s-a}{(s-a)^2+k^2}$$
$$\mathcal{L}\{t\sin(kt)\} = \frac{2ks}{(s^2+k^2)^2}$$
$$\mathcal{L}\{t\cos(kt)\} = \frac{s^2-k^2}{(s^2+k^2)^2}$$
$$\mathcal{L}\left\{e^{at}f(t)\right\} = F(s-a)$$
$$\mathcal{L}\{\mathcal{U}(t-a)\} = \frac{e^{-as}}{s}$$
$$\mathcal{L}\{f(t-a)\mathcal{U}(t-a)\} = e^{-as}F(s)$$
$$\mathcal{L}\{g(t)\mathcal{U}(t-a)\} = e^{-as}\mathcal{L}\{g(t+a)\}$$
$$\mathcal{L}\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}F(s)$$
$$\mathcal{L}\left\{f^{(n)}(t)\right\} = s^n F(s) - s^{n-1}f(0) - \dots - f^{(n-1)}(0)$$
$$(f*g)(t) = \int_0^t f(\tau)g(t-\tau)\,d\tau$$
$$\mathcal{L}\{f*g\} = F(s)G(s)$$