

## BRIEF TABLE OF INTEGRALS

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

## SOME TAYLOR SERIES

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

## TABLE OF LAPLACE TRANSFORMS

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