INTEGRALS

$$\int u^n\,du = \left(\frac{1}{n+1}\right)u^{n+1} + C, \quad n \neq -1$$
$$\int \frac{1}{u}\,du = \ln|u| + C$$
$$\int a^u\,du = \left(\frac{1}{\ln a}\right)a^u + C, \quad a>0$$
$$\int e^u\,du = e^u + C$$
$$\int \ln u\,du = u\ln u - u + C$$
$$\int (\ln u)^2\,du = u(\ln u)^2 - 2u\ln u + 2u + C$$
$$\int u\ln u\,du = \frac{1}{2}u^2\ln u - \frac{1}{4}u^2 + C$$

$$\int_a^b u\,dv = [uv]_a^b - \int_a^b v\,du$$

$$\int \sin u\,du = -\cos u + C$$
$$\int \cos u\,du = \sin u + C$$
$$\int \tan u\,du = -\ln|\cos u| + C = \ln|\sec u| + C$$
$$\int \cot u\,du = \ln|\sin u| + C = -\ln|\csc u| + C$$
$$\int \sec u\,du = \ln|\sec u + \tan u| + C = \ln\left|\tan\left(\frac{\pi}{4} + \frac{u}{2}\right)\right| + C$$
$$\int \csc u\,du = \pm\ln|\csc u \mp \cot u| + C = \ln\left|\tan\left(\frac{u}{2}\right)\right| + C$$
$$\int \sec^2 u\,du = \tan u + C$$
$$\int \csc^2 u\,du = -\cot u + C$$
$$\int \sec u\tan u\,du = \sec u + C$$
$$\int \csc u\cot u\,du = -\csc u + C$$

$$\int \frac{1}{\sqrt{a^2-u^2}}\,du = \arcsin\frac{u}{a}, \quad a>0$$
$$\int \frac{1}{a^2+u^2}\,du = \frac{1}{a}\arctan\frac{u}{a} + C, \quad a>0$$
$$\int \frac{1}{u\sqrt{u^2-a^2}}\,du = \frac{1}{a}\operatorname{arcsec}\frac{u}{a} + C, \quad |u|>a>0$$
$$\int \frac{1}{\sqrt{u^2+a^2}}\,du = \ln\left|u + \sqrt{u^2+a^2}\right| + C, \quad a>0$$
$$\int \frac{1}{\sqrt{u^2-a^2}}\,du = \ln\left|u + \sqrt{u^2-a^2}\right| + C, \quad |u|>a>0$$

$$\int \frac{1}{a^2-u^2}\,du = \frac{1}{2a}\ln\left|\frac{u+a}{u-a}\right| + C, \quad |u|>a>0$$
$$= \frac{1}{2a}\ln\left|\frac{a+u}{a-u}\right| + C, \quad |u|<a$$
$$\int \frac{1}{u\sqrt{a^2-u^2}}\,du = -\frac{1}{a}\ln\left|\frac{1}{u}\left(a+\sqrt{a^2-u^2}\right)\right| + C, \quad 0<|u|<a$$
$$\int \frac{1}{u\sqrt{a^2+u^2}}\,du = -\frac{1}{a}\ln\left|\frac{1}{u}\left(a+\sqrt{a^2+u^2}\right)\right| + C, \quad u \neq 0$$

DERIVATIVES

$$d(u^n) = nu^{n-1}\,du$$
$$d(u+v) = du + dv$$
$$d(uv) = u\,dv + v\,du$$
$$d\left(\frac{u}{v}\right) = (v\,du - u\,dv)/v^2$$

$$d(a^u) = a^u\ln a\,du$$
$$d(e^u) = e^u\,du$$
$$d(\ln u) = \frac{1}{u}\,du$$
$$d(\log_a u) = \frac{1}{u\ln a}\,du$$

$$d(\sin u) = \cos u\,du$$
$$d(\cos u) = -\sin u\,du$$
$$d(\tan u) = \sec^2 u\,du$$
$$d(\cot u) = -\csc^2 u\,du$$
$$d(\sec u) = \sec u\tan u\,du$$
$$d(\csc u) = -\csc u\cot u\,du$$

$$d(\arcsin u) = \frac{1}{\sqrt{1-u^2}}\,du$$
$$d(\arccos u) = -\frac{1}{\sqrt{1-u^2}}\,du$$
$$d(\arctan u) = \frac{1}{1+u^2}\,du$$
$$d(\operatorname{arccot} u) = -\frac{1}{1+u^2}\,du$$
$$d(\operatorname{arcsec} u) = \frac{1}{u\sqrt{u^2-1}}\,du$$
$$d(\operatorname{arccsc} u) = -\frac{1}{u\sqrt{u^2-1}}\,du$$

IDENTITIES

$$\log_e u = \log u = \ln u$$
$$\exp u = e^u$$
$$a^u = e^{u\ln a}$$

$$\log_b u = \ln u/\ln b$$
$$\ln uv = \ln u + \ln v$$
$$\ln\frac{u}{v} = \ln u - \ln v$$
$$\ln u^a = a\ln u$$

$$\sin^2 u + \cos^2 u = 1$$
$$\tan^2 u + 1 = \sec^2 u$$
$$\cot^2 u + 1 = \csc^2 u$$
$$\sin^2 u = \frac{1}{2}(1-\cos 2u)$$
$$\cos^2 u = \frac{1}{2}(1+\cos 2u)$$
$$\sin 2u = 2\sin u\cos u$$
$$\cos 2u = 2\cos^2 u - 1 = \cos^2 u - \sin^2 u = 1 - 2\sin^2 u$$
$$\tan 2u = (2\tan u)/(1-\tan^2 u)$$

	P	A	V
:	$2\pi r$	πr^2	
:		$\frac{1}{2}r^2\alpha$	
:		$\frac{1}{2}h(b+B)$	
:		lateral: $2\pi rh$	$\pi r^2 h$
: $(L=\sqrt{r^2+h^2})$		lateral: πrL	$\frac{1}{3}\pi r^2 h$
:		$4\pi r^2$	$\frac{4}{3}\pi r^3$

INTEGRATION FORMULAS

$$\int u^n\,du = \frac{u^{n+1}}{n+1} + C$$

$$\int e^u\,du = e^u + C$$

$$\int \sin u\,du = -\cos u + C$$

$$\int \cos u\,du = \sin u + C$$

$$\int \sec^2 u\,du = \tan u + C$$

$$\int \sec u \tan u\,du = \sec u + C$$

$$\int \csc^2 u\,du = -\cot u + C$$

$$\int \csc u \cot u\,du = -\csc u + C$$

$$\int \sec u\,du = \ln|\sec u + \tan u| + C$$

$$\int \csc u\,du = -\ln|\csc u + \cot u| + C$$

$$\int \tan u\,du = -\ln|\cos u| + C$$

$$\int \cot u\,du = \ln|\sin u| + C$$

$$\int u\,dv = uv - \int v\,du$$

$$\int_a^b u\,dv = [uv]_a^b - \int_a^b v\,du$$

$$\int \frac{du}{u} = \ln|u| + C$$

$$\int a^u\,du = \frac{a^u}{\ln a} + C$$

$$\int \frac{du}{\sqrt{a^2 - u^2}} = \arcsin\frac{u}{a} + C$$

$$\int \frac{du}{a^2 + u^2} = \frac{1}{a}\arctan\frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{u^2 - a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{u}{a} + C$$

$$\int \frac{du}{\sqrt{u^2 + a^2}} = \ln\left[u + \sqrt{u^2 + a^2}\right] + C$$

$$\int \frac{du}{\sqrt{u^2 - a^2}} = \ln\left|u + \sqrt{u^2 - a^2}\right| + C \quad \text{if } |u| > a$$

$$\int \frac{du}{a^2 - u^2} = \begin{cases} \frac{1}{2a}\ln\left(\frac{u+a}{u-a}\right) + C & \text{if } |u| > a \\ \frac{1}{2a}\ln\left(\frac{a+u}{a-u}\right) + C & \text{if } |u| < a \end{cases}$$

$$\int \frac{du}{u\sqrt{a^2 - u^2}} = \frac{-1}{a}\ln\left|\frac{a + \sqrt{a^2 - u^2}}{u}\right| + C \quad \text{for } 0 < |u| < a$$

$$\int \frac{du}{u\sqrt{a^2 + u^2}} = \frac{-1}{a}\ln\left|\frac{a + \sqrt{a^2 + u^2}}{u}\right| + C \quad \text{for } u \neq 0$$

$$\int \ln x\,dx = x\ln x - x + C$$

$$\int x\ln x\,dx = \tfrac{1}{2}x^2\ln x - \tfrac{1}{4}x^2 + C$$

$$\int (\ln x)^2\,dx = x(\ln x)^2 - 2x\ln x + 2x + C$$