DIFFERENTIATION TABLE (DERIVATIVES)

Notation: $u = u(x)$ and $v = v(x)$ are differentiable functions of x; c, n, and $a > 0$ are constants; $u' = \dfrac{\mathrm{d}u}{\mathrm{d}x}$ is the derivative of u with respect to (w.r. to) x

(1) $x' = 1$
(2) $c' = 0$
(3) $(cu)' = c \cdot u'$
(4) $(u \pm v)' = u' \pm v'$
(5) $(uv)' = u'v + v'u$
(6) $\left(\dfrac{u}{v}\right)' = \dfrac{u'v - v'u}{v^2}$
(7) $(u^n)' = nu^{n-1}u'$
(a) $\left(\dfrac{1}{u}\right)' = -\dfrac{u'}{u^2}$
(b) $(\sqrt{u}\,)' = \dfrac{u'}{2\sqrt{u}}$
(8) $(\sin u)' = \cos u \; u'$
(9) $(\cos u)' = -\sin u \; u'$
(10) $(\tan u)' = \sec^2 u \; u'$
(11) $(\cot u)' = -\csc^2 u \; u'$
(12) $(\sec u)' = \sec u \; \tan u \; u'$
(13) $(\csc u)' = -\csc u \; \cot u \; u'$
(14) $(a^u)' = a^u(\ln a)u'$
(15) $(e^u)' = e^u u'$
(16) $(\ln u)' = \dfrac{u'}{u}$
(17) $(\sin^{-1} u)' = \dfrac{u'}{\sqrt{1 - u^2}}$
(18) $(\cos^{-1} u)' = -\dfrac{u'}{\sqrt{1 - u^2}}$
(19) $(\tan^{-1} u)' = \dfrac{u'}{1 + u^2}$

(Note: $\sin^{-1} = \arcsin$, $\cos^{-1} = \arccos$, $\tan^{-1} = \arctan$.)

INTEGRATION TABLE (INTEGRALS)

Notation: $f(x)$ and $g(x)$ are any continuous functions; $u = u(x)$ is differentiable function of x; $du = \frac{du}{dx}\,dx = u'\,dx$; c, n, and $a > 0$ are constants

(1) $\int (f(x) + g(x))\,dx = \int f(x)\,dx + \int g(x)\,dx$

(2) $\int cf(x)\,dx = c\int f(x)\,dx$

(3) $\int u^n\,du = \frac{u^{n+1}}{n+1} + C,\ n \neq -1$

   (a) $\int \frac{1}{u}\,du = \int \frac{du}{u} = \ln|u| + C$

   (b) $\int \frac{1}{\sqrt{u}}\,du = \int \frac{du}{\sqrt{u}} = 2\sqrt{u} + C$

   (c) $\int du = u + C$

(4) $\int e^u\,du = e^u + C$

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

(6) $\int \cos u\,du = \sin u + C$

(7) $\int \sec^2 u\,du = \int \frac{1}{\cos^2 u}\,du = \tan u + C$

(8) $\int \csc^2 u\,du = \int \frac{1}{\sin^2 u}\,du = -\cot u + C$

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

(10) $\int \frac{1}{\sqrt{a^2 - u^2}}\,du = \int \frac{du}{\sqrt{a^2 - u^2}} = \frac{1}{a}\,\arcsin\frac{u}{a} + C$