Tables of basic derivatives and integrals (II)

DERIVATIVES

$$\frac{d}{dx}\, x^a = a x^{a-1}$$
$$\frac{d}{dx}\, e^x = e^x$$
$$\frac{d}{dx}\, \sin x = \cos x$$
$$\frac{d}{dx}\, \cos x = -\sin x$$
$$\frac{d}{dx}\, \tan x = \sec^2 x$$
$$\frac{d}{dx}\, \cot x = -\csc^2 x$$
$$\frac{d}{dx}\, \sec x = \sec x \tan x$$
$$\frac{d}{dx}\, \csc x = -\csc x \cot x$$

$$\frac{d}{dx}\, \ln x = \frac{1}{x}$$
$$\frac{d}{dx}\, a^x = a^x \ln a$$
$$\frac{d}{dx}\, \arcsin x = \frac{1}{\sqrt{1-x^2}}$$
$$\frac{d}{dx}\, \arccos x = -\frac{1}{\sqrt{1-x^2}}$$
$$\frac{d}{dx}\, \arctan x = \frac{1}{1+x^2}$$
$$\frac{d}{dx}\, \operatorname{arccot} x = -\frac{1}{1+x^2}$$
$$\frac{d}{dx}\, \operatorname{arcsec} x = \frac{1}{|x|\sqrt{x^2-1}}$$
$$\frac{d}{dx}\, \operatorname{arccsc} x = -\frac{1}{|x|\sqrt{x^2-1}}$$

constant rule: $\frac{d}{dx}\, c = 0$

constant multiple rule: $\frac{d}{dx}\,(cf(x)) = cf'(x)$

sum rule: $\frac{d}{dx}\,(f(x)+g(x)) = f'(x)+g'(x)$

product rule: $\frac{d}{dx}\,(f(x)g(x)) = f'(x)g(x)+f(x)g'(x)$

quotient rule: $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x)-f(x)g'(x)}{(g(x))^2}$

chain rule: $\frac{d}{dx}\,(f(g(x))) = f'(g(x))g'(x)$

a and c are constants

INTEGRALS

$$\int x^a\,dx = \frac{x^{a+1}}{a+1} + C \quad (a \neq 1)$$

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int e^x\,dx = e^x + C$$

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

$$\int \sin x\,dx = -\cos x + C$$

$$\int \cos x\,dx = \sin x + C$$

$$\int \tan x\,dx = -\ln|\cos x| + C$$

$$\int \cot x\,dx = \ln|\sin x| + C$$

$$\int \sec x\,dx = \ln|\sec x + \tan x| + C$$

$$\int \csc x\,dx = -\ln|\csc x + \cot x| + C$$

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

$$\int \cos^2 x\,dx = \frac{1}{2}x + \frac{1}{4}\sin 2x + C$$

$$\int \tan^2 x\,dx = \tan x - x + C$$

$$\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\arctan\left(\frac{x}{a}\right) + C$$

$$\int \sinh x\,dx = \cosh x + C$$

$$\int \frac{1}{ax+b}\,dx = \frac{1}{a}\ln|ax+b| + C$$

$$\int e^{ax}\,dx = \frac{1}{a}e^{ax} + C$$

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

$$\int \sin ax\,dx = -\frac{1}{a}\cos ax + C$$

$$\int \cos ax\,dx = \frac{1}{a}\sin ax + C$$

$$\int \tan ax\,dx = -\frac{1}{a}\ln|\cos ax| + C$$

$$\int \cot ax\,dx = \frac{1}{a}\ln|\sin ax| + C$$

$$\int \sec ax\,dx = \frac{1}{a}\ln|\sec ax + \tan ax| + C$$

$$\int \csc ax\,dx = -\frac{1}{a}\ln|\csc ax + \cot ax| + C$$

$$\int \cot^2 x\,dx = -\cot x - x + C$$

$$\int \sec^2 x\,dx = \tan x + C$$

$$\int \csc^2 x\,dx = -\cot x + C$$

$$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \arcsin\left(\frac{x}{a}\right) + C$$

$$\int \cosh x\,dx = \sinh x + C$$

u-substitution for definite integrals: $\int_a^b f(g(x))g'(x)\,dx = \int_{g(a)}^{g(b)} f(u)\,du$

integration by parts: $\int_a^b f(x)g'(x)\,dx = f(x)g(x)\big|_a^b - \int_a^b f'(x)g(x)\,dx$

a, b and C are constants