

# Formulae

## Differentiation Formulas

In all the formulas below,  $f'$  means  $d/dx(f(x))=f'(x)$  and  $g'$  means  $d/dx(g(x)) = g'(x)$ . Both  $f$  and  $g$  are the functions of  $x$  and differentiated with respect to  $x$ . Some of the general differentiation formulas are;

1. Power Rule:  $(d/dx) (x^n) = nx^{n-1}$
2. Derivative of a constant,  $a$ :  $(d/dx) (a) = 0$
3. Derivative of a constant multiplied with function  $f$ :  $(d/dx) (a \cdot f) = af'$
4. Sum Rule:  $(d/dx) (f \pm g) = f' \pm g'$
5. Product Rule:  $(d/dx) (fg) = fg' + gf'$
6. Quotient Rule:  $d/dx(f/g) = (gf' - fg')/g^2$

## Differentiation Formulas for Trigonometric Functions

Trigonometry is the concept of relation between angles and sides of triangles. Here, we have 6 main ratios, such as, sine, cosine, tangent, cotangent, secant and cosecant. You must have learned about basic trigonometric formulas based on these ratios. Now let us see, the formulas for derivative of trigonometric functions.

1.  $d/dx(\sin x) = \cos x$
2.  $d/dx(\cos x) = -\sin x$
3.  $d/dx(\tan x) = \sec^2 x$
4.  $d/dx(\cot x) = -\operatorname{cosec}^2 x$
5.  $d/dx(\sec x) = \sec x \tan x$
6.  $d/dx(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$

## Differentiation Formulas for Inverse Trigonometric Functions

Inverse trigonometry functions are the inverse of trigonometric ratios. Let us see the formulas for derivative of inverse trigonometric functions.

1.  $d/dx (\sin^{-1} x) = 1/\sqrt{1-x^2}$
2.  $d/dx (\cos^{-1} x) = -1/\sqrt{1-x^2}$
3.  $d/dx (\tan^{-1} x) = 1/(1+x^2)$
4.  $d/dx (\cot^{-1} x) = -1/(1+x^2)$
5.  $d/dx (\sec^{-1} x) = 1/(|x|\sqrt{1-x^2})$
6.  $d/dx (\operatorname{cosec}^{-1} x) = -1/(|x|\sqrt{1-x^2})$

## Other Differentiation Formulas

1.  $d/dx (a^x) = a^x \log a$
2.  $d/dx (e^x) = e^x$
3.  $d/dx (\log_a x) = (1/x)(\log a)$
4.  $d/dx (\log x) = 1/x$

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