Important Formulas:

DERIVATIVE OF STANDARD FUNCTIONS

$f(x)$	$\frac{d}{dx}(f(x))$	$f(x)$	$\frac{d}{dx}(f(x))$
x^n	nx^{n-1} ; $n \in R$	$\sec x$	$\sec x \tan x$, $x \neq (2n+1)\frac{\pi}{2}$
e^x	e^x	$\operatorname{cosec} x$	$-\operatorname{cosec} x \cot x$; $x \neq n\pi$
x^x	$x^x(1 + \ln x)$	$\cot x$	$-\operatorname{cosec}^2 x$, $x \neq n\pi$
a^x	$a^x \log_e a$; $a > 0$, $a \neq 1$	$\sin^{-1} x$	$\frac{1}{\sqrt{1-x^2}}$; $-1 < x < 1$
$\log_e x$	$\frac{1}{x}$; $x > 0$	$\cos^{-1} x$	$-\frac{1}{\sqrt{1-x^2}}$; $-1 < x < 1$
$\log_a x$	$\frac{1}{x \log_e a}$; $x > 0$	$\tan^{-1} x$	$\frac{1}{1+x^2}$; $x \in R$
$\sin x$	$\cos x$	$\sec^{-1} x$	$\frac{1}{\lvert x \rvert \sqrt{x^2-1}}$; $\lvert x \rvert > 1$
$\cos x$	$-\sin x$	$\operatorname{cosec}^{-1} x$	$\frac{-1}{\lvert x \rvert \sqrt{x^2-1}}$; $\lvert x \rvert > 1$
$\tan x$	$\sec^2 x$; $x \neq (2n+1)\frac{\pi}{2}$ $n \in I$	$\cot^{-1} x$	$\frac{-1}{1+x^2}$; $x \in R$

RULES FOR DIFFERENTIATION

$\frac{d}{dx}(K(f(x)) = K \cdot \frac{d}{dx}(f(x))$, where K is constant

$\frac{d}{dx}\{f(x) \pm g(x)\} = \frac{d}{dx}(f(x)) \pm \frac{d}{dx}(g(x))$

Product Rule: $\frac{d}{dx}\{f(x).g(x)\} = f(x)\frac{d}{dx}(g(x)) + g(x)\frac{d}{dx}(f(x))$

Quotient Rule: $\frac{d}{dx}\left\{\frac{f(x)}{g(x)}\right\} = \frac{g(x)\frac{d}{dx}(f(x)) - f(x)\frac{d}{dx}(g(x))}{(g(x))^2}$

Chain Rule: If y is a function of u, u is a function of v and v a function of x, then

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dv} \times \frac{dv}{dx}$$

Parametric differentiation: If x = P(t) , y = Q(t), where 't' is parameter then,

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{\frac{d}{dt}(Q(t))}{\frac{d}{dt}(P(t))} = \frac{Q'(t)}{P'(t)}$$

Differentiation of one function w.r.t. other function

$$\frac{d(f(x))}{d(g(x))} = \frac{\frac{d}{dx}(f(x))}{\frac{d}{dx}(g(x))} = \frac{f'(x)}{g'(x)}$$

Logarithmic differentiation: It is applicable in following cases:

→ $y = \underbrace{f_1.f_2.f_3.....f_n}_{}$ (All are functions of 'x') (product, divide or power form)

→ $y = (f(x))^{g(x)}$

* Take log on both sides and then differentiate.