

CALCULUS FORMULAE

S. No.	DIFFERENTIATION		INTEGRATION	
1	$\frac{d}{dx}(x^n)$	$nx^{n-1}$	$\int x^n dx$	$\frac{x^{n+1}}{n+1} + C$
2	$\frac{d}{dx}(ax + b)^n$	$n(ax + b)^{n-1}a$	$\int (ax + b)^n dx$	$\frac{(ax + b)^{n+1}}{(n+1)a} + C$
3	$\frac{d}{dx}(k)$	0	$\int o dx$	C
4	$\frac{d}{dx}(ku)$	$k \frac{du}{dx} = ku'$	$\int k dx$	$kx + C$
5	$\frac{d}{dx}(u \pm v)$	$u' \pm v'$		
6	$\frac{d}{dx}(uv)$	$u'v + uv'$		
7	$\frac{d}{dx}\left(\frac{u}{v}\right)$	$\frac{u'v - uv'}{v^2}$		
8	$\frac{d}{dx}(\sin x)$	$\cos x$	$\int \cos x dx$	$\sin x + C$
9	$\frac{d}{dx}(\cos x)$	$-\sin x$	$\int \sin x dx$	$-\cos x + C$
10	$\frac{d}{dx}(\tan x)$	$\sec^2 x$	$\int \sec^2 x dx$	$\tan x + C$
11	$\frac{d}{dx}(\cot x)$	$-\operatorname{cosec}^2 x$	$\int \operatorname{cosec}^2 x dx$	$-\cot x + C$
12	$\frac{d}{dx}(\sec x)$	$\sec x \tan x$	$\int \sec x \tan x dx$	$\sec x + C$
13	$\frac{d}{dx}(\operatorname{cosec} x)$	$-\operatorname{cosec} x \cot x$	$\int \operatorname{cosec} x \cot x dx$	$-\operatorname{cosec} x + C$
14	$\frac{d}{dx}(\sin^{-1} x)$	$\frac{1}{\sqrt{1-x^2}}$	$\int \frac{1}{\sqrt{1-x^2}} dx$	$\sin^{-1} x + C$
15	$\frac{d}{dx}(\cos^{-1} x)$	$\frac{-1}{\sqrt{1-x^2}}$		
16	$\frac{d}{dx}(\tan^{-1} x)$	$\frac{1}{1+x^2}$	$\int \frac{1}{1+x^2} dx$	$\tan^{-1} x + C$
17	$\frac{d}{dx}(\cot^{-1} x)$	$\frac{-1}{1+x^2}$		
18	$\frac{d}{dx}(\sec^{-1} x)$	$\frac{1}{x\sqrt{x^2-1}}$	$\int \frac{1}{x\sqrt{x^2-1}} dx$	$\sec^{-1} x + C$
19	$\frac{d}{dx}(\operatorname{cosec}^{-1} x)$	$\frac{-1}{x\sqrt{x^2-1}}$		
20	$\frac{d}{dx}(e^x)$	$e^x$	$\int e^x dx$	$e^x + C$
21	$\frac{d}{dx}(\log_a x)$	$\frac{1}{x} \log_e a$	$\int \frac{1}{ax+b} dx$	$\frac{\log ax+b }{a} + C$
22	$\frac{d}{dx}(\log_e x)$	$\frac{1}{x}$	$\int \frac{1}{x} dx$	$\log x  + C$
23	$\frac{d}{dx}(a^x)$	$a^x \log a, \quad a > 0$	$\int a^x dx$	$\frac{a^x}{\log a} + C$
24	$\frac{d}{dx}(u^v)$	$u^v \left[ \frac{v}{u} \frac{du}{dx} + \log u \frac{dv}{dx} \right]$		
25	Chain rule	$\frac{dy}{dx} = \frac{dy}{dt} \cdot \frac{dt}{dx}$		
26	$\frac{d}{dx}(u^n)$	$nu^{n-1} \frac{du}{dx}$		

a, b, C and k are constants; x, y, z, u & v are variables

LIST OF SUBSTITUTIONS INVOLVING INVERSE TRIGONOMETRIC FUNCTIONS:

1. If  $f(x)$  involves  $\sqrt{a^2 - x^2}$  put  $x = a \sin\theta$  ( or  $a \cos\theta$  )
2. If  $f(x)$  involves  $\sqrt{a^2 + x^2}$  put  $x = a \tan\theta$  ( or  $a \cot\theta$  )
3. If  $f(x)$  involves  $\sqrt{x^2 - a^2}$  put  $x = a \sec\theta$  ( or  $a \operatorname{cosec}\theta$  )
4. If  $f(x)$  involves both  $\sqrt{a^2 - x^2}$  and  $\sqrt{a^2 + x^2}$  put  $x^2 = a^2 \cos 2\theta$
5. If  $f(x)$  involves both  $\sqrt{a - x}$  and  $\sqrt{a + x}$  put  $x = a \cos 2\theta$