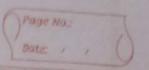
Formula Sheet Differentiation



Derivative of some standard functions:

-						
	y = f(x)	dy = f'(x)		y=F(x)	dy = f'(x)	
	c (constant)	0 nx ⁿ⁻¹	9172	Secx	Secx tanx	
	1 2	1 22	NA	cot x	-cosecxcolx -cosec2x ex	
	1 xn	- n x ⁿ⁺¹	0 00	a ^x	ax loga	
	√z	1 2√x	101+	logx	x	
	sinx	x200			x loga	
	cosx tanx	-sinx sec ² x	3(8)	loge	-Tx13	

· Rules of differentiation:

Composète functions

Composite function:

$$f[g(x)] = fog \qquad g[f(x)] gof.$$

$$y = (f(u)) \qquad u = g(x) \qquad y = f(g(x))$$
i.e. $y \rightarrow u \rightarrow x \qquad dy = dy \qquad du - chain rule.$

$$dx \qquad du \qquad dx.$$

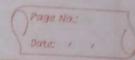
• Derivative of composite function:

$$y = f[g(x)] : \frac{dy}{dx} = f'[g(x)] \frac{d}{dx} g(x)$$

$$= f'[g(x)] \cdot g'(x)$$

· Derivative of standard inverse function:

sin-1 x	1 1-x2	x <1	cot-1 x	- 1 1+x2	XER	De la	
cos ⁻¹ x	$-\frac{1}{\sqrt{1-\chi^2}}$	121<1	sec-1 x	$\frac{1}{\chi\sqrt{\chi^2-1}}$	X71	- 1 xJx ² -1	x<1
tan-1x	1 1+x2	χER	cosec-1 x	$\frac{-1}{x\sqrt{x^2-1}}$	x>1	$\chi \sqrt{\chi^2-1}$	x<1



· Some important formulae for inverse trigo funtution:

2.
$$\cos^{-1}((\cos 0) = 0$$
, $\cos(\cos^{-1}x) = x$ 5. $\sec^{-1}(\sec 0) = 0$, $\sec(\sec^{-1}x) = x$

1.
$$\sin^{-1}(\cos 0) = \sin^{-1}\left[\sin\left(\frac{\pi}{2}-0\right)\right] = \frac{\pi}{2}-0$$

2.
$$\cos^{-1}(\sin \alpha) = \cos^{-1}(\cos(\frac{\pi}{2} - \alpha)) = \frac{\pi}{2} - \alpha$$

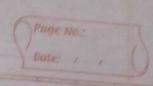
4.
$$\cot^{-1}(\tan 0) = \cot^{-1}[\cot(\frac{\pi}{2} - 0)] = \frac{\pi}{2} - 0$$

5.
$$cosec^{-1}(seco) = cosec^{-1}[cosec(\frac{\pi}{2}-0)] = \frac{\pi}{2}-0$$

6.
$$\operatorname{Sec}^{-1}(\operatorname{coseco}) = \operatorname{Sec}^{-1}\left[\operatorname{Sec}\left(\frac{\Pi}{2} - 0\right)\right] = \frac{\Pi}{2} - 0$$
.

1.
$$\sin^{-1}(x) = \csc^{-1}(\frac{1}{x})$$
 4. $\sec^{-1}(x) = \cos^{-1}(\frac{1}{x})$

2.
$$\cos(-1)(x) = \sin(-1)(\frac{1}{x})$$
 5. $\tan(-1)(x) = \cot(-1)(\frac{1}{x})$



· Some amportant substitution:

	Expression	Substitution.		
	VI-X2	a-al-a		
4	$\sqrt{1+\chi^2}$	V= Love 0		
	$\sqrt{\chi^2-1}$	N = C = 0		
	$\int_{0-x}^{0+x} or \int_{0+x}^{0-x}$	21 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
	Ja-x Ja+x	$x = a\cos 2\theta$ or $x = a\cos \theta$		
	$\int \frac{1+x}{1-x} \text{or} \int \frac{1-x}{1+x}$	x=cos20 or x=cos0		
	$\int \frac{a+x^2}{a-x^2} \text{or} \int \frac{a-x^2}{a+x^2}$	$\chi^2 = a\cos 2\theta$ or $\chi^2 = a\cos \theta$		
	2× 1+ ×2	z=tano		
	1-22	x=+an O		
	3x-4x3 or 1-2x2	x=sino		
1	$4x^3 - 3x$ or $2x^2 - 1$	x= cos 0		
	3x-x3	z=tan0		
	1-3x2	A CAN MONO CONTRACT E		
1	2500 or 1-f002	F(x)=+an0.		
	$\frac{2F(x)}{1+F(x)^2}$ or $\frac{1-F(x)^2}{1+F(x)^2}$	() all statement		

$$\tan^{-1}\left(\frac{x+y}{1-xy}\right) = \tan^{-1}x + \tan^{-1}y$$

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· Important Results:

1)
$$\frac{d}{dx}(x) = 1$$
 : $\frac{d}{dx}(x^{\circ}) = 71$

4)
$$x^m y^n = (x+y)^{m+n} = y$$

5)
$$\frac{y}{z}$$
 = const : $\frac{dy}{dx} = \frac{y}{z}$

6] d
$$\sqrt{f(x)} + \sqrt{f(x)} + \sqrt{f(x)}$$
.

dx = $f'(x)$

2y-1.

· Parametric Function:

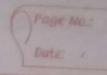
· Diff. one funt wir.t. another funt":

$$du = f(x) \qquad V = g(x)$$

$$du = f'(x) \qquad dv = g'(x) \qquad dv \qquad dv | dx \qquad g'(x)$$

$$y = f(x)$$

 $\frac{dy}{dx} = f'(x)$ $\frac{d^2y}{dx^2} = f''(x)$



• Succesive (nth order) diff:

Find 1st, 2nd, 3rd derivative.

Observe changes in coeff, angles, power, sign.

Find nth order wiret changes.