DIFFERENTIATION

SYNOPSIS

- If y = f(x) is differentiable at any point 'x' then its derivative is $f^1(x) = \underset{h\to 0}{Lt}\frac{f(x+h)-f(x)}{h}$ and it is called the first derivative of f(x)
  A function f is said to be derivable at x=a if $\underset{x\to a}{Lt}\frac{f(x)-f(a)}{x-a}$ exists. The limit is called the derivative of f at x=a and is denoted by $f^1(a)$.
  i.e., $\underset{x\to a^+}{Lt}\frac{f(x)-f(a)}{x-a} = \underset{x\to a^-}{Lt}\frac{f(x)-f(a)}{x-a}$ then the limit value denoted by $f^1(a)$ is called derivative of f(x) at x=a.
- Let f be a function defined on [a, b]. Then f is said to be differentiable on [a, b], if
  - f is differentiable at 'c' i.e., $\underset{x\to c}{Lt}\frac{f(x)-f(c)}{x-c}$ where $c\in(a, b)$ exists
  - f is right differentiable at 'a' i.e., $\underset{x\to a^+}{Lt}\frac{f(x)-f(a)}{x-a}$ exists
  - f is left differentiable at 'b' i.e., $\underset{x\to b^-}{Lt}\frac{f(x)-f(b)}{x-b}$ exists.
- If f(x), g(x) are two differentiable functions of 'x' then the linear combination of the two functions is also differentiable function of 'x'.
  i.e., $\frac{d}{dx}\left(c_1f(x)+c_2g(x)\right)=c_1\frac{d}{dx}f(x)+c_2\frac{d}{dx}g(x)$ where c_1, c_2 are constants.
- PRODUCT RULE: If f(x), g(x) are two differentiable functions of 'x' then
  - $\frac{d}{dx}\left(f(x).g(x)\right)=g(x)\frac{d}{dx}f(x)+f(x)\frac{d}{dx}g(x)$
  - If f(x), g(x), h(x) are three differentiable functions of 'x' then

$$\frac{d}{dx}\left(f(x).g(x).h(x)\right)=g(x).h(x)\frac{d}{dx}f(x)+f(x).h(x)\frac{d}{dx}g(x)+f(x).g(x)\frac{d}{dx}h(x)$$

- QUOTIENT RULE: If f(x), g(x) are two differentiable functions of 'x' then

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

- PARAMETRIC DIFFERENTIATION: If x=f(t) and y=g(t) are the parametric equations of a curve then

$$\frac{dy}{dx}=\frac{dy}{dt}.\frac{dt}{dx}=\frac{g^1(t)}{f^1(t)}$$

- $\frac{d}{dx}\left(x^n\right)=n.x^{n-1}$
- $\frac{d}{dx}(\sin x)=\cos x$
- $\frac{d}{dx}(\text{Cos}x)=-\text{Sin}x$
- $\frac{d}{dx}(\tan x)=\sec^2 x$
- $\frac{d}{dx}(\cot x)=-\text{cosec}^2 x$
- $\frac{d}{dx}(\sec x)=\sec x.\tan x$
- $\frac{d}{dx}(\text{cosec}x)=-\text{cosec}x.\cot x$
- $\frac{d}{dx}(e^x)=e^x$
- $\frac{d}{dx}(a^x)=a^x.\log a$
- $\frac{d}{dx}(\log x)=\frac{1}{x}$
- $\frac{d}{dx}(Sin^{-1}x)=\frac{1}{\sqrt{1-x^2}}\quad x\in(-1,1)$
- $\frac{d}{dx}(Cos^{-1}x)=\frac{-1}{\sqrt{1-x^2}}\quad x\in(-1,1)$
- $\frac{d}{dx}(Tan^{-1}x)=\frac{1}{1+x^2}\quad x\in R$
- $\frac{d}{dx}(Cot^{-1}x)=\frac{-1}{1+x^2}\quad x\in R$
- $\frac{d}{dx}(Sec^{-1}x)=\frac{1}{|x|.\sqrt{x^2-1}}\quad x<-1\ or\ x>1$
- $\frac{d}{dx}(Co\sec^{-1}x)=\frac{-1}{|x|.\sqrt{x^2-1}}\quad x<-1\ or\ x>1$
- $\frac{d}{dx}(\sinh x)=\cosh x$
- $\frac{d}{dx}(\cosh x)=\sinh x$
- $\frac{d}{dx}(\tanh x)=\text{sech}^2 x$
- $\frac{d}{dx}(\coth x)=-\text{cosech}^2 x$

$\frac{d}{dx}(\sec hx)=-\sec hx\tanh x$

- $\frac{d}{dx}$ (cosechx)= -cosechx.cothx
- $\frac{d}{dx}(Sinh^{-1}x)=\frac{1}{\sqrt{1+x^2}}$
- $\frac{d}{dx}(Cosh^{-1}x)=\frac{1}{\sqrt{x^2-1}}$
- $\frac{d}{dx}(Tanh^{-1}x)=\frac{1}{1-x^2}$ for $x\in(-1, 1)$
- $\frac{d}{dx}(Coth^{-1}x)=\frac{1}{1-x^2}$ for $x\in(-\infty, -1)\cup(1, \infty)$
- $\frac{d}{dx}(Sech^{-1}x)=\frac{-1}{x\sqrt{1-x^2}}$ for $x\in(0, 1)$
- $\frac{d}{dx}(Cosech^{-1}x)=\frac{-1}{|x|.\sqrt{1+x^2}}$
  for $x\in(-\infty, 0)\cup(0, \infty)$
- If f(x, y)=0 then $\frac{dy}{dx}=\frac{-f_x}{f_y}$
  where f_x, f_y are the partial derivatives.
- If y= $\sqrt{f(x)+\sqrt{f(x)+\sqrt{f(x)+........to\infty}}}$ then
  $\frac{dy}{dx}=\frac{f^1(x)}{(2y-1)}$.
- Let f(x), g(x) be the two differentiable functions of 'x'
  and if $y=f(x)^{g(x)}$ then
  $\frac{dy}{dx}=y\left(g^1(x)\log f(x)+g(x)\frac{f^1(x)}{f(x)}\right)$.
- If y=f(x)+$\frac{1}{y}$ then $\frac{dy}{dx}=\frac{y^2f^1(x)}{y^2+1}$
- If f(x+y)=f(x).f(y) $\forall$ x, y $\in$ **R** and $f(x)\neq 0$ then $f^1(x)=f^1(0).f(x)$.
- $\frac{d}{dx}\left(\frac{ax+b}{cx+d}\right)=\frac{ad-bc}{(cx+d)^2}$
- $\frac{d}{dx}\left(\frac{af(x)+b}{cf(x)+d}\right)=\frac{(ad-bc)f^1(x)}{\{cf(x)+d\}^2}$
- $\frac{d}{dx}\{\log_e f(x)\}=\frac{f^1(x)}{f(x)}$
- $\frac{d}{dx}\{\sqrt{f(x)}\}=\frac{f^1(x)}{2\sqrt{f(x)}}$
- $\frac{d}{dx}\left\{\frac{1}{f(x)}\right\}=\frac{-f^1(x)}{(f(x))^2}$
- $\frac{d}{dx}\{(f(x))^n\}=n\{f(x)\}^{n-1}.f^1(x)$
- If y = $Tan^{-1}\left(\frac{f(x)\pm g(x)}{1\mp f(x).g(x)}\right)$ then
  $\frac{dy}{dx}=\frac{f^1(x)}{1+\{f(x)\}^2}\pm\frac{g^1(x)}{1+\{g(x)\}^2}$
- If y=(gof)(x) then $\frac{dy}{dx}$ = $g^1(f(x)).f^1(x)$
- If y=f(x) and z=g(x) then $\frac{dy}{dz}=\frac{f^1(x)}{g^1(x)}$.
- If $y=f(x)^y$ then $\frac{dy}{dx}=\frac{y^2.f^1(x)}{f(x)\{1-y\log_e f(x)\}}$
- While differentiating the given function using trigonometric transformation, observe the following points.
- If the function involve the term $\sqrt{a^2-x^2}$, then put $x = a\sin\theta$ or $x = a\cos\theta$
- If the function involve the term $\sqrt{a^2+x^2}$, then put $x = a\tan\theta$ or $x = a\cot\theta$
- If the function involve the term $\sqrt{x^2-a^2}$, then put $x = a\sec\theta$ or $x = a\,\text{cosec}\,\theta$
- If the function involve the term
  $\sqrt{\frac{a-x}{a+x}}$ or $\sqrt{\frac{a+x}{a-x}}$, then put $x = a\cos\theta$ or $x = a\cos 2\theta$
- All the above substitutions are also true if $a = 1$
- If $f(x) = |x|$, then $f^1(0)$ does not exist.
  $\frac{d|x|}{dx}=\frac{|x|}{x}$, if $x\neq 0$
- If $f(x) = |x|$, f(x) is continuous at $x = 0$ but not differentiable at $x = 0$.
- If $f(x) = x\sin\frac{1}{x}$, f(x) is continuous at $x = 0$ butnot differentiable at $x = 0$
- If $f(x) = x\cos\frac{1}{x}$, f(x) is continuous at $x = 0$ **but not differentiable at x = 0.**

MULTIPLE CHOICE QUESTIONS
LEVEL - I

1. $\underset{h\to 0}{Lt}\dfrac{\sqrt{x+h}-\sqrt{x}}{h}=$

1. $\sqrt{x}$ 2. $\dfrac{1}{2\sqrt{x}}$ 3. $2\sqrt{x}$ 4. $\dfrac{1}{\sqrt{x}}$

2. $\dfrac{d}{dx}\left\{x+\dfrac{1}{x}\right\}=$

1. $1-\dfrac{1}{x^2}$ 2. $1+\dfrac{1}{x^2}$ 3. $\dfrac{1}{x^2}-1$ 4. $1-\dfrac{1}{x}$

3. $\dfrac{d}{dx}\left\{\dfrac{3x-5}{2x+3}\right\}=$

1. $\dfrac{19}{(2x+3)^2}$ 2. $\dfrac{14}{(2x+3)^2}$

3. $\dfrac{-19}{(2x+3)^2}$ 4. $\dfrac{-1}{(2x+3)^2}$

4. If $y=1+\dfrac{x}{1!}+\dfrac{x^2}{2!}+\dfrac{x^3}{3!}+...........to\infty$ then $\dfrac{dy}{dx}=$

1. x 2. 0 3. y 4. $\dfrac{1}{y}$

5. If $ax^2+2hxy+by^2=0$ then $\dfrac{dy}{dx}=$

1. $-\left(\dfrac{ax+hy}{hx+by}\right)$ 2. $\left(\dfrac{ax+hy}{hx+by}\right)$

3. -(ax+hy)(hx+by) 4. (ax+hy)(hx+by)

6. If $x^2+y^2+2gx+2fy+c=0$ then $\dfrac{dy}{dx}=$

1. $-\left(\dfrac{g+x}{f+y}\right)$ 2. $\dfrac{f+y}{g+x}$ 3. $\dfrac{xy+g}{f+x^2}$ 4. $\dfrac{x+g}{y+g}$

7. If $ax^2+2hxy+by^2+2gx+2fy+c=0$ then $\dfrac{dy}{dx}=$

1. $\dfrac{-(ax+hy+g)}{(hx+by+f)}$ 2) $\dfrac{-(hx+by+f)}{(ax+hy+g)}$

3) $\dfrac{(ax+hy+g)}{(hx+by+f)}$ 4) $\dfrac{(hx+by+f)}{(ax+hy+g)}$

8. If $Sin^2mx+Cos^2ny=a^2$ then $\dfrac{dy}{dx}=$

1. $\dfrac{m.Sin2mx}{n.Sin2ny}$ 2. $\dfrac{m.Sinmx}{n.Sinnx}$

3. $\dfrac{-m.Cos2mx}{n.Cos2nx}$ 4. $\dfrac{n.Sin2mx}{m.Sin2nx}$

9. $\underset{h\to 0}{Lt}\dfrac{Sin(3x+3h)-Sin3x}{h}=$

1. 3Cos3x 2. $\dfrac{3}{2}$ Cos3x 3. -3Cos3x 4. 0

10. $\underset{h\to 0}{Lt}\dfrac{\tan\sqrt{x+h}-\tan\sqrt{x}}{h}=$

1. $Sec^2\sqrt{x}$ 2. $\dfrac{Sec^2\sqrt{x}}{2\sqrt{x}}$ 3. $\dfrac{-\tan\sqrt{x}}{2\sqrt{x}}$ 4. $\dfrac{\tan\sqrt{x}}{2\sqrt{x}}$

11. $\dfrac{d}{dx}\left\{\dfrac{a-b\cos x}{a+b\cos x}\right\}=$

1. $\dfrac{2ab\cos x}{(a+b\cos x)^2}$ 2. $\dfrac{2ab\sin x}{(a+b\cos x)^2}$

3. $\dfrac{-2ab\cos x}{(a+b\cos x)^2}$ 4. $\dfrac{-2ab\sin x}{(a+b\cos x)^2}$

12. $\dfrac{d}{dx}(3Sinx^0)=$

1. $3\cos x^0$ 2. $\dfrac{3\pi}{180}\sin x^0$

3. $3\pi\sin x^0$ 4. $\dfrac{\pi}{60}\cos x^0$

13. If $y=\sec(x^0+30^0)$ then $\dfrac{dy}{dx}=$

1. $\dfrac{\pi}{60}\sec(x^0+30^0).\tan(x^0+30^0)$

2. $\dfrac{\pi}{180}\sec(x^0+30^0)\tan(x^0+30^0)$

3. $\dfrac{-\pi}{60}\sec^2(x^0+30^0).\tan(x^0+30^0)$

4. $\dfrac{-\pi}{180}\sec(x^0+30^0)\tan(x^0+30^0)$

14. If $x+y=\sin(x+y)$ then $\dfrac{dy}{dx}=$

1. $\dfrac{1}{2}$ 2. 0 3. -1 4. $\dfrac{1}{3}$

15. $\dfrac{d}{dx}\left\{\sin^{-1}\dfrac{x}{a}\right\}=$

1. $\dfrac{1}{\sqrt{a^2+x^2}}$ 2. $\dfrac{1}{\sqrt{a^2-x^2}}$

3. $\dfrac{x}{\sqrt{a^2-x^2}}$ 4. $\dfrac{-1}{\sqrt{a^2-x^2}}$

16. If y= $Tan^{-1}\left(\cot\left(\frac{\pi}{2}-x\right)\right)$ then $\frac{dy}{dx}$ =

1. 1 2. -1 3. 0 4. $\frac{1}{2}$

17. $\frac{d}{dx}$ [log(coshx)]=

1. sinhx 2. cothx 3. tanhx 4. -cothx

18. $\frac{d}{dx}$ [$\sinh^{-1}3x$]=

1. $\frac{3}{\sqrt{1+9x^2}}$ 2. $\frac{3}{\sqrt{1-9x^2}}$ 3. $\frac{1}{\sqrt{1+9x^2}}$ 4. $\frac{1}{\sqrt{1-9x^2}}$

19. $\frac{d}{dx}\left(\cosh^{-1}\frac{x}{2}\right)$ =

1. $\frac{1}{\sqrt{x^2+4}}$ 2. $\frac{1}{\sqrt{x^2-4}}$ 3. $\frac{-1}{\sqrt{x^2+4}}$ 4. $\frac{-1}{\sqrt{x^2-4}}$

20. If f(x) = $\frac{a^x}{x^a}$ $then \ f'(a) =$

1) log a - 1 2) log a - a
3) a log a - a 4) aloga + a

21. $\underset{h\to 0}{Lt}\frac{e^{2x+2h}-e^{2x}}{h}$ =

1. e^{2x} 2. $-e^{2x}$ 3. $2e^{2x}$ 4. $\frac{-1}{2}e^{2x}$

22. $\frac{d}{dx}\left\{e^{\log\sqrt{1+\cot^2 x}}\right\}$ =

1. cosecx cotx 2. -cosecx.cotx
3. cosec^2x.cotx 4. 0

23. If y= $3^{2\log x+7}$ then $\frac{dy}{dx}$ =

1. $\frac{2}{x}$log3 2. $\frac{2y.\log 3}{x}$
3. 2xy 4. $\frac{-2\log 3}{x}$

24. If y= $a^x.e^x$ then $\frac{dy}{dx}$ =

1. y(1+loga) 2. y^2(1+loga)
3. -y(1+loga) 4. y(1-loga)

25. $\frac{d}{dx}\left\{e^{ax}.\sin(bx+c)\right\}$ =

1. e^{ax}\{asin(bx+c)+bcos(bx+c)\}
2. e^{ax}\{acos(bx+c)+bsin(bx+c)\}
3. e^{ax}\{asin(bx+c)-bcos(bx+c)\}
4. e^{ax}\{acos(bx+c)-bsin(bx+c)\}

26. If x=at², y=2at then $\frac{dy}{dx}$ =

1. $\frac{1}{t}$ 2. t 3. t^2 4. 1

27. If x=tan t, y=cos t, 0 < t < $\frac{\pi}{2}$ then $\frac{dy}{dx}$ =

1. xy^2 2. $-x^2y$ 3. xy 4. $-xy^3$

28. If $|x|<1$, then

$\frac{d}{dx}\left[1+\frac{p}{q}x+\frac{p(p+q)}{\angle 2}\left(\frac{x}{q}\right)^2+\frac{p(p+q)(p+2q)}{\angle 3}\left(\frac{x}{q}\right)^3....\infty\right]$ =

1. $\frac{p}{q}\frac{1}{(1-x)^{\frac{p}{q}+1}}$ 2. $\frac{p}{q}\frac{1}{(1-x)^{\frac{p}{q}}}$
3. $(1-x)^{-pq-1}$ 4. $(1-x)^{pq+1}$

29. The derivative of $Tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ w.r.t

$Tan^{-1}\left(\frac{2x\sqrt{1-x^2}}{1-2x^2}\right)$ at x = 0 is

1. 1/4 2. 1/8 3. 1/2 4. 1

30. If [x] denotes the greatest integer contained in x then for 4 < x < 5, $\frac{d}{dx}\{[x]\}$ =

1. [x - 4, 5] 2. [x]
3. 0 4. 1

31. If $f(x)=ax^2+bx+c$ then $\underset{x\to 5}{Lt}\frac{f(x)-f(5)}{x-5}$ =

1. 5a + 5 2. 10 a + 5
3. 25a + 5b + b 4. 10 a + b

32. A differentiable function f is defined for all x > 0 as $f(x)=6x+5$ then $f^1(16)$ is equal to

1. 64 2. 16 3. 32 4. 6

33. If $\left(\frac{x}{a}\right)^n+\left(\frac{y}{b}\right)^n=2$ then $\frac{dy}{dx}$ at (a, b) is

1. a/ b 2. -a/b 3. b /a 4. -b/a

34. If f(x) is an odd differentiable function defined on $(-\infty,\infty)$ such that $f^1(3)=2$ then $f^1(-3)=$

1. 0 2. 1 3. 2 4. 4

KEY

1. 2	2. 1	3. 1	4. 3	5. 1
6. 1	7. 1	8. 1	9. 1	10.2
11. 2	12. 4	13. 2	14. 3	15.2
16. 1	17. 3	18. 1	19. 2	20.1
21. 3	22. 2	23. 2	24. 1	25.1
26. 1	27. 4	28.1	29.1	30.3
31.4	32.4	33.4	34.3	

LEVEL - II

1. $\frac{d}{dx}\left\{\frac{x^2-x+1}{x^2+x+1}\right\}=$

1. $\frac{2(x^2-1)}{(x^2+x+1)^2}$ 2. $\frac{2(x^2+1)}{(x^2+x+1)^2}$

3. $\frac{2(1-x^2)}{(x^2+x+1)^2}$ 4. $\frac{-2(1+x^2)}{(x^2+x+1)^2}$

2. If $y=\left(x+\sqrt{x^2-a^2}\right)^n$ then $(x^2-a^2)\left(\frac{dy}{dx}\right)^2=$

1. n^2y 2. $-n^2y$ 3. ny^2 4. n^2y^2

3. If $y=\frac{1}{\sqrt{x^2+4}+\sqrt{x^2+2}}$ then $\frac{dy}{dx}=$

1. $\frac{x}{2}\left[\frac{1}{\sqrt{x^2+4}}-\frac{1}{\sqrt{x^2+2}}\right]$

2. $\frac{x}{2}\left[\frac{1}{\sqrt{x^2+4}}+\frac{1}{\sqrt{x^2+2}}\right]$

3. $\frac{-x}{2}\left[\frac{1}{\sqrt{x^2+4}}+\frac{1}{\sqrt{x^2+2}}\right]$

4. $\frac{1}{2}\left[\frac{1}{\sqrt{x^2+4}}+\frac{1}{\sqrt{x^2+2}}\right]$

4. If $y^2-2x^2=y$ then $\left(\frac{dy}{dx}\right)_{(1,-1)}=$

1. $\frac{-4}{3}$ 2. $\frac{4}{3}$ 3. $\frac{3}{4}$ 4. $\frac{-3}{4}$

5. If $3x^2+4xy+2y^2+x-8=0$ then $\left(\frac{dy}{dx}\right)_{(-1,3)}=$

1. $\frac{3}{8}$ 2. $\frac{-7}{8}$ 3. $\frac{5}{8}$ 4. $\frac{-5}{8}$

6. If $(x+y)^2=ax^2+by^2$ then $\frac{dy}{dx}=$

1. $\frac{x(a+1)-y}{x+y(1-b)}$ 2. $\frac{x(a-1)-y}{x+y(1-b)}$

3. $\frac{x(a+1)+y}{x+y(1-b)}$ 4. $\frac{x(a+1)+y}{x+y(1+b)}$

7. If $xy=x+y$, then $\frac{dy}{dx}=$

1. $\frac{xy}{1-x}$ 2. $\frac{y+1}{1-x}$ 3. $\frac{y}{1-xy}$ 4. $\frac{-1}{(x-1)^2}$

8. If $x^2-y^2=a(x-y)$ and $x\neq y$, then $\frac{dy}{dx}=$

1. 1 2. $\frac{1}{2}$ 3. $\frac{1}{3}$ 4. -1

9. $\frac{d}{dx}(4\cos^3x^0-3\cos x^0)=$

1. $\frac{-\pi}{60}\sin 3x^0$ 2. $\cos 3x^0$

3. $\tan 3x^0$ 4. $\frac{\pi}{60}\sin 3x^0$

10. $\frac{d}{dx}\left(\sqrt{Sin\sqrt{x}}\right)=$

1. $\frac{\cos\sqrt{x}}{4\sqrt{x\sin\sqrt{x}}}$ 2. $\frac{\sin\sqrt{x}}{4\sqrt{x\cos\sqrt{x}}}$

3. $\frac{-\cos\sqrt{x}}{4\sqrt{x\sin\sqrt{x}}}$ 4. $\frac{-\tan\sqrt{x}}{4\sqrt{x\cos\sqrt{x}}}$

11. If $y=\sqrt{\frac{1-\cos x}{1+\cos x}}$ then $\frac{dy}{dx}=$

1. $\sec^2\frac{x}{2}$ 2. $x\sec\frac{x}{2}$

3. $x^2\sec\frac{x}{2}$ 4. $\frac{1}{2}\sec^2\frac{x}{2}$

12. If $y=\sqrt{\frac{1-\sin 2x}{1+\sin 2x}}$ then $\left(\frac{dy}{dx}\right)_{x=0}=$

1. $\frac{1}{2}$ 2. 1 3. -2 4. 2

13. If $y=\cos(1-x^2)^2$ then $\frac{dy}{dx}=$

1. $4x(1-x^2)\sin(1-x^2)^2$ 2. $4x(1-x^2)\sin(1-x^2)$
3. $-4x(1-x^2)\sin(1-x^2)^2$ 4. $4x(1+x^2)\sin(1+x^2)$

14. If $y=Sin^5(3x+1)$ then $\frac{dy}{dx}=$

1. $\sin^4(3x+1)\cos^2(3x+1)$
2. $15\sin^4(3x+1)\cos(3x+1)$
3. $15\sin^5(3x+1)\cos(3x+1)$
4. $-\sin^4(3x+1)\cos 2(3x+1)$

15. $\frac{d}{dx}(\sin^5x.\sin 5x)=$

1. $\sin^4x.\sin 5x$ 2. $5\sin^4x.\sin 6x$
3. $5\sin^4x.\sin 5x$ 4. $-5\sin^4x.\sin 6x$

16. If $y=\log_2\log_3\log_5{}^x$ then $\left(\frac{dy}{dx}\right)_{x=125}=$

1. $\frac{1}{125\log_2\log_3\log_5}$

2. $\frac{1}{250\log_2\log_3\log_5}$

3. $\frac{1}{375\log_2\log_3\log_5}$

4. $\frac{1}{500\log_2\log_3\log_5}$

17. $\frac{d}{dx}\{\sin^3x.\cos3x\}$=

1. $-3\sin^2x.\cos4x$
2. $3\sin^2x.\cos4x$
3. $-3\sin^3x.\cos3x$
4. $3\sin^3x.\cos3x$

18. If y=$\sin^32x.\cos^23x$ then $\frac{dy}{dx}$ =

1. $6\sin^32x.\cos3x$
2. $6\sin^22x.\cos3x.\cos5x$
3. $\sin^22x.\cos3x.\cos5x$
4. $-6\sin^22x.\cos3x.\cos5x$

19. $\frac{d}{dx}\left(\sin\sqrt{2x-3}\right)$=

1. $\frac{\cos\sqrt{2x-3}}{\sqrt{2x-3}}$
2. $\frac{-\cos\sqrt{2x-3}}{2\sqrt{2x-3}}$
3. $\sqrt{2x-3}\cos\sqrt{2x-3}$
4. $\cos\sqrt{2x-3}$

20. If $\text{Tan}(x+y)+\text{Tan}(x-y)=1$ then $\frac{dy}{dx}$ =

1. $\frac{Sec^2(x+y)+Sec^2(x-y)}{Sec^2(x+y)-Sec^2(x-y)}$
2. $-\left[\frac{Sec^2(x+y)+Sec^2(x-y)}{Sec^2(x+y)-Sec^2(x-y)}\right]$
3. $\frac{Sec^2(x+y)-Sec^2(x-y)}{Sec^2(x+y)+Sec^2(x-y)}$
4. $\frac{1}{2(x^2+y^2)}$

21. If ysinx=x+y then $\frac{dy}{dx}$ at x=0 is

1. 1
2. -1
3. 0
4. 2

22. If y=xsiny, then $\frac{dy}{dx}$ =

1. $\frac{1-x\sin y}{\sin y}$
2. $\frac{1-x\sin y}{x\cos y}$
3. $\frac{1-\sin y}{x\cos y}$
4. $\frac{\sin^2 y}{\sin y-y\cos y}$

23. If cosy=x.cos(a+y) then $\frac{dy}{dx}$ =

1. $\frac{\cos^2(a+y)}{\sin a}$
2. $\frac{\cos^2(a+y)}{\cos a}$
3. $\frac{\cos a}{\sin^2(a+y)}$
4. $\frac{\cos(a+y)}{\sin a}$

24. If y=$\sqrt{\sec^2x+\operatorname{cosec}^2x}$ then $\frac{dy}{dx}$ =

1. -4cosec2x.cot2x
2. sec2x
3. 2cosec2x.cot2x
4. 2sec2x

25. If y=$\sqrt{\frac{\sec x-1}{\sec x+1}}$ then $\frac{dy}{dx}$ =

1. $\frac{1}{2}\sec^2\frac{x}{2}$
2. $\sec^2\frac{x}{2}$
3. $\frac{1}{2}\tan\frac{x}{2}$
4. $\tan\frac{x}{2}$

26. $\frac{d}{dx}\left\{\sin^{-1}x+\cos^{-1}\sqrt{1-x^2}\right\}$ =

1. $\frac{1}{\sqrt{1-x^2}}$
2. $\frac{x}{\sqrt{1-x^2}}$
3. $\frac{2}{\sqrt{1-x^2}}$
4. $\frac{4}{\sqrt{1-x^2}}$

27. If y=$\sin^{-1}\sqrt{\frac{1-x}{2}}$ then $\frac{dy}{dx}$ =

1. $\frac{-1}{2\sqrt{1-x^2}}$
2. $\frac{1}{2\sqrt{1-x^2}}$
3. $\frac{1}{\sqrt{1-x^2}}$
4. $\frac{-x}{\sqrt{1-x^2}}$

28. $\frac{d}{dx}\left\{\sin^{-1}x+\sin^{-1}\sqrt{1-x^2}\right\}$ =

1. $\frac{1}{2}$
2. $\frac{2}{\sqrt{1-x^2}}$
3. $2\sqrt{1-x^2}$
4. 0

29. If y=$Tan^{-1}\sqrt{\frac{1-\cos x}{1+\cos x}}$ then $\frac{dy}{dx}$ =

1. 1
2. -1
3. $\frac{-1}{2}$
4. $\frac{1}{2}$

30. If y=$Tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ then $\frac{dy}{dx}$ =

1. 1
2. -1
3. $\frac{-1}{2}$
4. $\frac{1}{3}$

31. If y=Tan^{-1}(secx+tanx) then $\frac{dy}{dx}$ =

1. 1
2. $\frac{1}{2}$
3. -1
4. 0

32. If y=Cot^{-1}(cosecx-cotx) then $\frac{dy}{dx}$ =

1. 1
2. $\frac{-1}{2}$
3. -1
4. 0

33. If y=Sin^{-1}(Cosx) then $\frac{dy}{dx}$ =

1. 1
2. -1
3. 0
4. 2

34. If y=$\cos^{-1}\sqrt{\frac{1+x}{2}}$ then $\frac{dy}{dx}$ =

1. $\frac{-1}{2\sqrt{1-x^2}}$
2. $\frac{1}{2\sqrt{1-x^2}}$
3. $\frac{1}{\sqrt{1-x^2}}$
4. $\frac{-1}{\sqrt{1-x^2}}$

35. $\frac{d}{dx}\left\{\frac{1}{2}\cot h\frac{x}{2}-\frac{1}{6}\cot h^3\frac{x}{2}\right\}=$

1. $-\frac{1}{4}\operatorname{cos}ec\,h\frac{4x}{2}$ 2. $-1/4\cot h^4 x/2$

3. $1/4\operatorname{cos}ec\,h^4 x/2$ 4. $1/4\cot h^4 x/2$

36. $\frac{d}{dx}\left\{\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right\}$

1. $\frac{2}{\sqrt{1-x^2}}$ 2. $\frac{-2}{\sqrt{1-x^2}}$ 3. $\frac{1}{\sqrt{1-x^2}}$ 4. $\frac{2}{1+x^2}$

37. $\frac{d}{dx}\left\{\operatorname{cos}ec^{-1}\frac{1}{2x\sqrt{1-x^2}}\right\}=$

1. $\frac{1}{\sqrt{1-x^2}}$ 2. $\frac{2}{\sqrt{1-x^2}}$

3. $2\sqrt{1-x^2}$ 4. $\frac{2}{1+x^2}$

38. $\frac{d}{dx}\left\{Tan^{-1}\frac{x}{1+x^2}+Tan^{-1}\frac{1+x^2}{x}\right\}=$

1. 0 2. 1 3. $\frac{1}{2}$ 4. 2

39. $\frac{d}{dx}\left\{Tan^{-1}\frac{\sqrt{x}+\sqrt{a}}{1-\sqrt{ax}}\right\}=$

1. $\frac{1}{2\sqrt{x}(1+x)}$ 2. $\frac{-1}{2\sqrt{x}(1+x)}$

3. $\frac{2}{\sqrt{x}(1+x)}$ 4. $\frac{-2}{\sqrt{x}(1+x)}$

40. $\frac{d}{dx}\left\{\sec^{-1}\frac{\sqrt{x}+1}{\sqrt{x}-1}+\sin^{-1}\frac{\sqrt{x}-1}{\sqrt{x}+1}\right\}=$

1. -1 2. 0 3. 1 4. 2

41. If y= $Sin^{-1}\sqrt{\frac{x-a}{b-a}}$, a<x<b then $\frac{dy}{dx}$ =

1. $\frac{1}{\sqrt{(x-a)(b-x)}}$ 2. $\frac{1}{2\sqrt{(x-a)(b-x)}}$

3. $\frac{-1}{2\sqrt{(x-a)(b-x)}}$ 4. $\frac{-1}{\sqrt{(x-a)(b-x)}}$

42. If y= $Tan^{-1}\sqrt{\frac{x-a}{b-x}}$, a<x<b then $\frac{dy}{dx}$ =

1. $\frac{1}{2\sqrt{(x-a)(b-x)}}$ 2. $\frac{1}{\sqrt{(x-a)(b-x)}}$

3. $\sqrt{\frac{x-a}{b-x}}$ 4. $\sqrt{\frac{b-x}{x-a}}$

43. If y=sin(2sin^{-1}x) then $\frac{dy}{dx}$ =

1. $\sqrt{\frac{1-y^2}{1-x^2}}$ 2. $\sqrt{\frac{1-x^2}{1-y^2}}$

3. $2\sqrt{\frac{1-y^2}{1-x^2}}$ 4. $2\sqrt{\frac{1-x^2}{1-y^2}}$

44. If y=Sin^{-1}(4x^3-3x) then $\frac{dy}{dx}$ =

1. $\frac{3}{\sqrt{1-x^2}}$ 2. $\frac{-3}{\sqrt{1-x^2}}$ 3. $\frac{1}{\sqrt{1-x^2}}$ 4. $\frac{-1}{\sqrt{1-x^2}}$

45. If y= $Tan^{-1}\left(\frac{(3-x)\sqrt{x}}{1-3x}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{3}{(1+x)\sqrt{x}}$ 2. $\frac{3}{2(1+x)\sqrt{x}}$

3. $\frac{-3}{2(1+x)\sqrt{x}}$ 4. 0

46. If y= $\mathrm{Tan}^{-1}\left(\frac{x^{\frac{1}{3}}+a^{\frac{1}{3}}}{1-x^{\frac{1}{3}}a^{\frac{1}{3}}}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{1}{3x^{\frac{2}{3}}\left(1+x^{\frac{2}{3}}\right)}$ 2. $\frac{-1}{3x^{\frac{2}{3}}\left(1+x^{\frac{2}{3}}\right)}$

3. $\frac{1}{x^{\frac{2}{3}}\left(1+x^{\frac{2}{3}}\right)}$ 4. $\frac{-1}{x^{\frac{2}{3}}\left(1+x^{\frac{2}{3}}\right)}$

47. If y= $Tan^{-1}\left(\frac{3a^2x-x^3}{a^3-3ax^2}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{3a}{a^2+x^2}$ 2. $\frac{1}{a^2+x^2}$

3. $\frac{-3a^2}{a^2+x^2}$ 4. $\frac{-3a}{a^2+x^2}$

48. If y= $Tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$ then $\frac{dy}{dx}$ =

1. $\frac{1}{1+x^2}$ 2. $\frac{-1}{1+x^2}$ 3. $\frac{1}{2(1+x^2)}$ 4. $\frac{2}{1+x^2}$

49. If y= $Tan^{-1}\left(\frac{6x-8x^3}{1-12x^2}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{-6}{1+4x^2}$ 2. $\frac{6}{1+4x^2}$ 3. $\frac{1}{1+4x^2}$ 4. $\frac{1}{1+x^2}$

50. If y= $Tan^{-1}\left(\frac{\sqrt{1+a^2x^2}-1}{ax}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{a}{2(1+a^2x^2)}$ 2. $\frac{-a}{2(1+a^2x^2)}$

3. $\frac{1}{2(1+a^2x^2)}$ 4. $\frac{a^2}{2(1+a^2x^2)}$

51. If y= $Tan^{-1}\left(\frac{3x-4}{1+12x}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{1}{1+9x^2}$ 2. $\frac{-1}{1+9x^2}$ 3. $\frac{3}{1+9x^2}$ 4. $\frac{-3}{1+9x^2}$

52. If y=Sin^{-1}(3x-4x^3)+Cos^{-1}(4x^3-3x) then $\frac{dy}{dx}$ =

1. -1 2. $\frac{1}{2}$ 3. 0 4. 2

53. If y= $Cos^{-1}\left(\frac{1-x^{2p}}{1+x^{2p}}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{2px^{p-1}}{1+x^{2p}}$ 2. $\frac{px^{p-1}}{1+x^{2p}}$ 3. $\frac{x^{p-1}}{1+x^{2p}}$ 4. $\frac{2px^{p-1}}{1+x^{p}}$

54. If y= $Tan^{-1}\left(\frac{4\sqrt{x}}{1-4x}\right)$ then $\frac{dy}{dx}$ =

1. $\frac{2}{\sqrt{x}(1+4x)}$ 2. $\frac{1}{\sqrt{x}(1+4x)}$

3. $\frac{-2}{1+4x}$ 4. $\frac{2}{1+4x^2}$

55. If y= $Tan^{-1}\left(\sqrt{1+x^2}-x\right)$ then $\frac{dy}{dx}$ =

1. $\frac{1}{1+x^2}$ 2. $\frac{-1}{2(1+x^2)}$ 3. $\frac{1}{2(1+x^2)}$ 4. $\frac{-1}{1+x^2}$

56. $\frac{d}{dx}\cot^{-1}\left(\frac{1+x}{1-x}\right)$ =

1. $\frac{1}{1+x^2}$ 2. $\frac{-1}{1+x^2}$ 3. $\frac{1}{\sqrt{1-x^2}}$ 4. $\frac{-1}{\sqrt{1-x^2}}$

57. $\frac{d}{dx}$ {sin^{-1}(6x-32x^3)}=

1. $\frac{6}{\sqrt{1-4x^2}}$ 2. $\frac{1}{\sqrt{1-4x^2}}$

3. $\frac{-1}{\sqrt{1-4x^2}}$ 4. $\frac{-6}{\sqrt{1-4x^2}}$

58. $\frac{d}{dx}\left(Tan^{-1}\frac{x}{\sqrt{a^2-x^2}}\right)$ =

1. $\frac{1}{\sqrt{a^2+x^2}}$ 2. $\frac{-1}{\sqrt{a^2+x^2}}$

3. $\frac{x}{\sqrt{a^2-x^2}}$ 4. $\frac{1}{\sqrt{a^2-x^2}}$

59. $\frac{d}{dx}\left(\cot^{-1}\left(\frac{1+\cos x}{\sin x}\right)\right)$ =

1. 1 2. $\frac{1}{2}$ 3. $\frac{1}{3}$ 4. -1

60. $\frac{d}{dx}\left(\cot^{-1}\left(\frac{3-2\tan x}{2+3\tan x}\right)\right)$ =

1. $\frac{-1}{1+x^2}$ 2. $\frac{1}{1+x^2}$ 3. 0 4. 1

61. If y=aCosθ-bSinθ then $y^2+\left(\frac{dy}{d\theta}\right)^2$ =

1. $\frac{a^2}{b^2}$ 2. $\frac{b^2}{a^2}$ 3. a^2 - b^2 4. a^2 + b^2

62. The derivative of $Cos^{-1}\frac{1-x^2}{1+x^2}$ w.r.t. $Tan^{-1}\frac{2x}{1-x^2}$ is

1. 0 2. 1 3. 2 4. $\frac{1}{2}$

63. The derivative of $Tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$ w.r.t. Tan^{-1}x is

1. 0 2. 1 3. 2 4. $\frac{1}{2}$

64. If f(x)=x.Sin$\frac{1}{x}$ for x$\neq$0, f(0)=0 then

1. f is continuous at x=0
2. f is differentiable at x=0
3. f ^{1}(0$^-$) exists but f ^{1}(0$^+$) does not exist
4. f is discontinuous at x=0

65. If f(x) = $\frac{1+\tan x}{1-\tan x}$, then f ^{1}(x) =

1) $\sec^2\left(\frac{\pi}{4}+x\right)$ 2) $\sec^2\left(\frac{\pi}{4}-x\right)$

3) $-\sec^2\left(\frac{\pi}{4}-x\right)$ 4) $-\sec^2\left(\frac{\pi}{4}+x\right)$

66. $\frac{d}{dx}\left[\frac{\tan x-\cot x}{\tan x+\cot x}\right]$ =

1) 2 sin2x 2) -2 sin2x
3) 2 cos2x 4) -2 cos2x

67. $\frac{d}{dx}\left[\tan^{-1}\frac{\sqrt{2ax-x^2}}{a-x}\right] =$

1) $\frac{1}{\sqrt{a^2-x^2}}$ 2) $\frac{1}{\sqrt{2ax-x^2}}$

3) $\frac{-1}{\sqrt{2ax-x^2}}$ 4) $\frac{-1}{\sqrt{a^2-x^2}}$

68. If x siny = 3 siny + 4 cosy , then $\frac{dy}{dx} =$

1) $\frac{-\sin^2 y}{4}$ 2) $\frac{\sin^2 y}{4}$

3) $\frac{-\cos^2 y}{4}$ 4) $\frac{\cos^2 y}{4}$

69. If $y = c\ \cosh\frac{x}{c}$ then $\sqrt{1+\left(\frac{dy}{dx}\right)^2} =$

1) sinh x/c 2) c sinh x/c
3) 1/c sinh x/c 4) y/c

70. If a function satisfies $f^1(x) = f(x)$, then f(x) =
1) e^{2x} 2) logx 3) ce^x 4) tanx

71. If $y = 2e^{\sqrt{x}}\left(\sqrt{x}-1\right)$ then $\frac{dy}{dx} =$

1) $2e^{\sqrt{x}}$ 2) $1/2e^{\sqrt{x}}$ 3) $e^{-\sqrt{x}}$ 4) $e^{\sqrt{x}}$

72. $\frac{d}{dx}\left\{3^{\frac{-5}{3}\log_3(2x+1)}\right\} =$

1. $\frac{-10}{3(2x+1)^{8/3}}$ 2. $\frac{10}{3(2x+1)^{8/3}}$

3. $\frac{1}{(2x+1)^{8/3}}$ 4. $\frac{-1}{(2x+1)^{8/3}}$

73. $\frac{d}{dx}\left\{e^{n(\log(a+x)-\log(a-x))}\right\} =$

1. $2an\left(\frac{a+x}{a-x}\right)^{n-1}$ 2. $\frac{-2an(a+x)^{n-1}}{(a-x)^{n+1}}$

3. $\frac{2an(a+x)^{n-1}}{(a-x)^{n+1}}$ 4. $2an\left(\frac{a+x}{a-x}\right)^{n}$

74. If $y = 5^{2\{\log_5(x+1)-\log_5(3x+1)\}}$ then $\frac{dy}{dx}$ at x=0 is

1. 0 2. $\frac{1}{3}$ 3. $\frac{3}{5}$ 4. -4

75. $\frac{d}{dx}\{5^{\log x}\} =$

1. $5^{\log x}$ 2. $5^{\log x}$.log5

3. x. $5^{\log x}$.log5 4. $\frac{5^{\log x}.\log 5}{x}$

76. If $y = a^{a^x}$ then $\frac{dy}{dx} =$

1. $y.a^x(\log a)^2$ 2. $y.a^x.\log a$
3. $(y.a^x)^2$ 4. $(y.a^x)$

77. $\frac{d}{dx}\left[e^{3\log x+x^2}\right] =$

1. $e^{3\log x+x^2}\left(2x+\frac{3}{x}\right)$ 2. $e^{3\log x+x^2}\left(2x-\frac{3}{x}\right)$

3. $e^{3\log x+x^2}$ 4. $e^{3\log x}$

78. $\frac{d}{dx}\left[a^{\log(\sin x)}\right] =$

1. $a^{\log(\sin x)}$.tanx.loga 2. $a^{\log(\sin x)}$.cotx.loga
3. $a^{\log(\sin x)}$ 4. $-a^{\log(\sin x)}$

79. If $e^{x+y} = xy$ then $\frac{dy}{dx} =$

1. $\frac{y(1-x)}{x(y-1)}$ 2. $\frac{-y(1-x)}{x(y-1)}$

3. $\frac{x(y-1)}{y(1+x)}$ 4. $\frac{-x(y-1)}{y(1+x)}$

80. $\frac{d}{dx}\left(\frac{e^{4x}+e^{-4x}}{e^{4x}-e^{-4x}}\right) =$

1. $\frac{16}{(e^{4x}-4^{-4x})^2}$ 2. $\frac{-16}{(e^{4x}-e^{-4x})^2}$

3. $\frac{(e^{4x}+e^{-4x})}{(e^{4x}-e^{-4x})^2}$ 4. $\frac{-(e^{4x}+e^{-4x})}{(e^{4x}-e^{-4x})^2}$

81. $\frac{d}{dx}\left(\frac{3^x-3^{-x}}{3^x+3^{-x}}\right) =$

1. $\frac{4\log 3}{(3^x+3^{-x})^2}$ 2. $\frac{-4\log 3}{(3^x+3^{-x})^2}$

3. $\frac{1}{(3^x+3^{-x})^2}$ 4. $\frac{-1}{(3^x+3^{-x})^2}$

82. The derivation of $a^{\sin x}$ w.r.t. cosx is
1. cotx.$a^{\sin x}$.loga 2. -cotx.$a^{\sin x}$.loga
3. tanx.$a^{\sin x}$.loga 4. -tanx.$a^{\sin x}$.loga

83. The derivative of $\sec^{-1}\left(\frac{1}{2x^2-1}\right)$ w.r.t. $\sqrt{1-x^2}$ is

1. 0 2. x 3. $\frac{x}{2}$ 4. $\frac{2}{x}$

84. The derivative of a^x w.r.t. $\sin^{-1}x$ is

1. $a^x.\log_e a\sqrt{1-x^2}$ 2. $\frac{a^x.\log_e a}{\sqrt{1-x^2}}$

3. $\frac{a^x}{\sqrt{1-x^2}}$ 4. $\frac{-a^x}{\sqrt{1-x^2}}$

85. The derivative of $e^{\sin^{-1}x}$ w.r.t. logx is

1. $\frac{-xe^{\sin^{-1}x}}{\sqrt{1-x^2}}$ 2. $\frac{xe^{\sin^{-1}x}}{\sqrt{1-x^2}}$

3. $\frac{e^{\sin^{-1}x}}{\sqrt{1-x^2}}$ 4. $e^{\sin^{-1}x}.\sqrt{1-x^2}$

86. The derivative of $\tan^2x$ w.r.t. $\cos^2x$ is
1. $\sec^4x$ 2. $-\sec^4x$ 3. $\cos a^4x$ 4. $-\cos a^4x$

87. The derivative of $Sin^{-1}\left(2x\sqrt{1-x^2}\right)$ w.r.t. $Tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ is

1. $\frac{2(1+x^2)}{3\sqrt{1-x^2}}$ 2. $\frac{3\sqrt{1-x^2}}{2(1+x^2)}$

3. $\frac{1+x^2}{\sqrt{1-x^2}}$ 4. 0

88. The derivative of $Sin^{-1}(3x-4x^3)$ w.r.t. $Tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$ is
1. 1 2. 2 3. 3 4. 0

89. The derivative of $Sin^{-1}\left(\frac{1-x}{1+x}\right)$ w.r.t. $\sqrt{x}$ is

1. $\frac{1}{1+x}$ 2. $\frac{-2}{1+x}$ 3. $\frac{-1}{1+x}$ 4. $\frac{2}{1+x}$

90. If $x=a\cos^3t$, $y=a\sin^3t$ then $\frac{dy}{dx}$ at $t=\frac{\pi}{3}$ is

1. $\sqrt{3}$ 2. $\frac{1}{\sqrt{3}}$ 3. $-\sqrt{3}$ 4. $\frac{-1}{\sqrt{3}}$

91. If $x=a(1-\cos\theta)$, $y=a(\theta+\sin\theta)$ then $\frac{dy}{dx}$ at $\theta=\frac{\pi}{2}$ is

1. 1 2. $\frac{1}{2}$ 3. 0 4. $\frac{-1}{2}$

92. If $x=a(\cos t+\log(\tan t/2))$, $y=a\sin t$ then $\frac{dy}{dx}=$
1. sin t 2. cot t 3. tan t 4. $\tan^2 t$

93. If $x=3\cos t-\cos^3t$; $y=3\sin t-\sin^3t$ then $\frac{dy}{dx}=$
1. $\cot^3t$ 2. $-\cot^3t$ 3. $\tan^3t$ 4. $-\tan^3t$

94. If $\sqrt{a^2-x^2}+\sqrt{a^2-y^2}=k(x-y)$ then $\frac{dy}{dx}=$

1. $\sqrt{\frac{a^2-y^2}{a^2-x^2}}$ 2. $-\sqrt{\frac{a^2+y^2}{a^2+x^2}}$

3. $\sqrt{\frac{a^2+x^2}{a^2+y^2}}$ 4. $\frac{1}{2}\sqrt{\frac{a^2+y^2}{a^2+x^2}}$

95. If $x=a(t+\sin t)$, $y=a(1-\cos t)$ if $\frac{dx}{dy}=\cot p$ then p=

1. t 2. 2t 3. $\frac{t}{2}$ 4. $-t^2$

96. If $x = e^t(\cos t + \sin t)$, $y = e^t(\cos t - \sin t)$ then $\frac{dy}{dx}=$
1. tan t 2. -tan t 3. cot t 4. $\cot^2t$

97. If $x=2\cos t-\cos 2t$, $y=2\sin t-\sin 2t$ then $\frac{dy}{dx}$ at $t=\frac{\pi}{4}$ is

1. $\sqrt{2}-1$ 2. $2\sqrt{2}$ 3. $\sqrt{2}+1$ 4. 0

98. If $x=\sin\theta+\theta\cos\theta$, $y=\cos\theta-\theta\sin\theta$ then $\frac{dy}{dx}$ at $\theta=\frac{\pi}{2}$ is

1. $\frac{-\pi}{2}$ 2. $\frac{2}{\pi}$ 3. $\frac{\pi}{4}$ 4. $\frac{4}{\pi}$

99. If $x=a\cos^2 2t$, $y=b\sin^2 2t$, then $\frac{dy}{dx}$ at $t=\frac{18\pi}{5}$ is

1. $\frac{a}{b}$ 2. $\frac{-b}{a}$ 3. $\frac{b}{a}$ 4. $\frac{-a}{b}$

100. If $x=a\cos^4t$, $y=b\sin^4t$ then $\frac{dy}{dx}$ at $t=\frac{3\pi}{4}$ is

1. $\frac{-b}{a}$ 2. $\frac{b}{a}$ 3. $\frac{a}{b}$ 4. $\frac{-a}{b}$

101. If x=Sin^{-1}t, y=log(1-t^2) then $\left(\frac{dy}{dx}\right)$ at t=$\frac{1}{2}$ is

1. $\frac{2}{\sqrt{3}}$ 2. $\frac{\sqrt{3}}{2}$ 3. $\frac{-2}{\sqrt{3}}$ 4. $\frac{-\sqrt{3}}{2}$

102. $y=e^{|\sin^2 x+\sin^4 x+\sin^6 x+....+\infty|}$, then $\frac{dy}{dx}=$

1) $e^{\tan^2 x}$ 2) $e^{\tan^2 x}\sec^2 x$
3) $2e^{\tan^2 x}\tan x.\sec^2 x$ 4) 1

103. If y = $\sin^{-1}\left[\frac{e^x-e^{-x}}{e^x+e^{-x}}\right]$, then $\frac{dy}{dx}=$

1) e sechx 2) sechx 3) sech^{2}x 4) e^{2}sec^{2}hx

104. If y=$\sqrt{a^{3x+1}+\sqrt{a^{3x+1}+\sqrt{a^{3x+1}+......to\infty}}}$ then $\frac{dy}{dx}$ =

1. $\frac{a^{3x+1}.\log a}{(2y-1)}$ 2. $\frac{3.a^{3x+1}.\log a}{(2y-1)}$

3. $\frac{3.a^{3x+1}.\log a}{(2y+1)}$ 4. $\frac{a^{3x+1}.\log a}{(2y+1)}$

105. If y=$\sqrt{Sin\sqrt{x}+y}$ then $\frac{dy}{dx}$ =

1. $\frac{Cos\sqrt{x}}{2\sqrt{x}(2y-1)}$ 2. $\frac{Cos\sqrt{x}}{2\sqrt{x}(2y+1)}$

3. $\frac{Sin\sqrt{x}}{2\sqrt{x}(2y-1)}$ 4. $\frac{Sin\sqrt{x}}{2\sqrt{x}(2y+1)}$

106. If y=$\sqrt{\log(Cos 2x)+y}$ then $\frac{dy}{dx}$ =

1. $\frac{2\tan 2x}{(2y-1)}$ 2. $\frac{\tan 2x}{(2y-1)}$

3. $\frac{-2\tan 2x}{(2y-1)}$ 4. $\frac{1}{(2y-1)}$

107. If y=$\sqrt[3]{x+\sqrt[3]{x+\sqrt[3]{x+.......to\ \infty}}}$ then $\frac{dy}{dx}$ =

1. $\frac{1}{(3y^2-1)}$ 2. $\frac{1}{(3y^2+1)}$

3. $\frac{1}{(2y-1)}$ 4. $\frac{1}{(2y+1)}$

108. If y=$\sqrt[3]{Sinx+y}$ then $\frac{dy}{dx}$ =

1. $\frac{\sin x}{(3y^2-1)}$ 2. $\frac{\cos x}{(3y^2-1)}$

3. $\frac{-\cos x}{(3y^2+1)}$ 4. $\frac{\sin x}{(3y^2+1)}$

109. If y=$x^{x^{x^{\cdot^{\cdot^{\infty}}}}}$ then $\frac{dy}{dx}$ =

1. $\frac{y^2}{x(1+y\log x)}$ 2. $\frac{y^2}{x(1-\log x)}$

3. $\frac{y^2}{x(1-y\log x)}$ 4. $\frac{y^2}{x(1+\log x)}$

110. If y=$(e^x)^{(e^x)^{(e^x)^{\cdot^{\cdot^{to\ \infty}}}}}$, then $\frac{dy}{dx}$ =

1. $\frac{y^2}{1-xy}$ 2. $\frac{y^2}{1+xy}$ 3. y^2(1-xy) 4. y^2(1+xy)

111. If y=$(\sin x)^{(\sin x)^{(\sin x)^{(\sin x)^{\cdot^{\cdot^{to\ \infty}}}}}}$ then $\frac{dy}{dx}$ =

1. $\frac{y^2}{1-y\log(\sin x)}$ 2. $\frac{y^2\cot x}{1-y\log(\sin x)}$

3. $\frac{y^2\cot x}{1+y\log(\sin x)}$ 4. $\frac{y^2}{1+y\log(\sin x)}$

112. If y = x^x + 2^x then $\frac{dy}{dx}$ =

1. x^x.log(e^x)+2^x 2. x^x + 2^x log2
3. x^x.log(ex)+2^x.log2 4. x^x - 2^x log2

113. $\frac{d}{dx}\left\{Cos^{-1}\left(\frac{2\cos x+3\sin x}{\sqrt{13}}\right)\right\}$ =

1. $\frac{-1}{2}$ 2. 1 3. $\frac{1}{2}$ 4. 0

114. $\frac{d}{dx}\left\{Sin^{-1}\left(\frac{5x+12\sqrt{1-x^2}}{13}\right)\right\}$ =

1. $\frac{1}{\sqrt{1-x^2}}$ 2. $\frac{-1}{\sqrt{1-x^2}}$ 3. $\frac{2}{\sqrt{1-x^2}}$ 4. 0

115. The set of all points where the function f(x)=$\frac{x}{1+|x|}$ is differentiable is

1. (-∞ , ∞) 2. (0, ∞)
3. (-∞ , 0) U (0, ∞) 4. (-∞ , 0)

116. If f(a)=2, $f^1(a)=1$, g(a)=-1, $g^1(a)=2$ then

$$\underset{x\to a}{Lt}\frac{g(x)f(a)-g(a)f(x)}{x-a}=$$

1. -5 2. $\frac{1}{5}$ 3. 5 4. 1

117. Let f(x) be an odd function. Then $f^1(x)$ is
1. is an even function 2. is an odd function
3. may be even or odd 4. neither even nor odd

118. The function f(x) = | x - 3|, $x \geq 1$

$= \frac{x^2}{4}-\frac{3x}{2}+\frac{13}{4}$, x<1

1. not continuous at x=1
2. not derivable at x=1
3. continuous and derivable at x=1
4. continuous at x=1 but not derivable at x=1

119. If f is an even function and $f^1(x)$ exists then $f^1(0)$=
1. 0 2. 1 3. -1 4. f(0)

120. If f(x) = | x | then $f^1(0)$=
1. 0 2. 1 3. -1 4. doesn't exist

121. $\frac{d}{dx}\left\{\log_a(x^2+1)\right\}$=

1. $\frac{\log_a^e .2x}{(x^2+1)}$ 2. $\frac{\log_e^a .2x}{(x^2+1)}$

3. $\frac{2x}{(x^2+1)}$ 4. $\frac{-2x}{(x^2+1)}$

122. $\frac{d}{dx}\left\{\log(x+\sqrt{a^2+x^2})\right\}$ =

1. $\frac{1}{(x+\sqrt{a^2+x^2})}$ 2. $\frac{x}{\sqrt{a^2+x^2}}$

3. $\frac{1}{x(x+\sqrt{a^2+x^2})}$ 4. $\frac{1}{\sqrt{a^2+x^2}}$

123. $\frac{d}{dx}$ {log(Cosecx+Cotx)}=
1. Cosecx 2. -Cosecx
3. Cosecx.Cotx 4. Cotx

124. $\frac{d}{dx}$ {log(Secx+Tanx)}=
1. Secx 2. -Secx
3. Sec^2x 4. Secx.Tanx

125. $\frac{d}{dx}$ [log{log(logx)}]=

1. $\frac{1}{x\log x\log(\log x)}$ 2. $\frac{-1}{x\log x\log(\log x)}$

3. $\frac{x}{\log x\log(\log x)}$ 4. $\frac{1}{\log x\log(\log x)}$

126. $\frac{d}{dx}\left\{\log(x+\sqrt{x^2-1})\right\}$ =

1. $\frac{1}{x^2-1}$ 2. $\sqrt{x^2-1}$ 3. $\frac{1}{\sqrt{x^2-1}}$ 4. x^2-1

127. $\frac{d}{dx}$ { x^n.logx } =
1. x^n (1+nlogx) 2. x^{n-1} (1+nlogx)
3. x^{n-1} (1-nlogx) 4. $x^{n-1}(1-n\log x)$

128. If y=log$\left(\frac{1}{1+x}\right)$ then $\frac{dy}{dx}$ =
1. 0 2. y 3. $-e^y$ 4. logy

129. If $x^y = e^{x-y}$ then $\frac{dy}{dx}$ =

1. $\frac{\log x}{1+\log x}$ 2. $\frac{\log x}{(1+\log x)^2}$

3. $\frac{-\log x}{(1+\log x)^2}$ 4. $\frac{-\log x}{1+\log x}$

130. If $y=(\cos ec\,hx)^{(\cos ec\,hx)\ldots\ldots\infty}$, then $\frac{dy}{dx}$ =

1. $\frac{-y^2\cot hx}{1-y\log\operatorname{cosec}hx}$ 2. $\frac{-y^2\tan hx}{1-y\log\cos hx}$

3. $\frac{-y^2\tan hx}{1-y\log\cos ec\,hx}$ 4. None

131. $\frac{d}{dx}$ { $x^{\tan x}$ } =

1. $x^{\tan x}\left\{\frac{\tan x}{x}+\sec^2 x.\log x\right\}$

2. $x^{\tan x}\left\{\frac{\tan x}{x}-\sec^2 x.\log x\right\}$

3. $x^{\tan x}\left\{\frac{x}{\tan x}+\sec^2 x.\log x\right\}$

4. $x^{\tan x}\left\{\frac{x}{\tan x}-\sec^2 x.\log x\right\}$

132. $\frac{d}{dx}\left\{(\log x)^{\log x}\right\}$=

1. $(\log x)^{\log x}\left\{\frac{1+\log(\log x)}{x}\right\}$

2. $(\log x)^{\log x}\left\{\frac{1-\log(\log x)}{x}\right\}$

3. $(\log x)^{\log x}\left\{\frac{1+\log x}{x}\right\}$

4. $(\log x)^{\log x}\left\{\frac{1-\log x}{x}\right\}$

133. $\frac{d}{dx}\{x^a + a^x + x^x + a^a\} =$

1. $ax^{a-1}+a^x+x^x.\log x$ 2. $ax^{a-1}+a^x\log a+x^x.\log x$
3. $ax^{a-1}+a^x\log a+x^x.\log ex$ 4. $x^a+a^x+x^x$

134. If $y = 2^{2^x}$ then $\frac{dy}{dx} =$

1. $y.(\log 2)^2.2^x$ 2. $y(\log 2).2^x$
3. $y2(\log 2)^2.2^x$ 4. $-y(\log 2).2^x$

135. If $y = (ax+b)^{(cx+d)}$ then $\frac{dy}{dx} =$

1. $y\left\{\frac{a(cx+d)}{(ax+b)} + c\log(ax+b)\right\}$

2. $y\left\{\frac{a(cx+d)}{(ax+b)} - c\log(ax+b)\right\}$

3. $y\left\{\frac{(cx+d)}{(ax+b)} + \log(ax+b)\right\}$

4. $y\left\{\frac{(cx+d)}{(ax+b)} - \log(ax+b)\right\}$

136. If $y=x^{\sin x}$ then $\frac{dy}{dx} =$

1. $y\left(\cos x.\log x - \frac{\sin x}{x}\right)$

2. $y\left(\cos x.\log x + \frac{\sin x}{x}\right)$

3. $y\left(\log x - \frac{\sin x}{x}\right)$ 4. $\frac{y}{x}$

137. If $y=(\sin x)^x$ then $\frac{dy}{dx} =$

1. $y\{\log(\sin x)+x\cot x\}$ 2. $y\{\log(\sin x)-x\cot x\}$
3. $\{\log(\sin x)-x\cot x\}$ 4. $\{\log(\sin x)+x\cot x\}$

138. If $y=x^{2x}$ then $\frac{dy}{dx} =$

1. $y(1+\log x)$ 2. $y(1-\log x)$
3. $2y(1+\log x)$ 4. $y(1+2\log x)$

139. $y = \tan^{-1}\sqrt{\frac{1-x}{1+x}}$ then $\frac{dy}{d(\cos^{-1}x)} = \ldots\ldots$

1. -2 2. $-\frac{1}{2}$ 3. $\frac{1}{2}$ 4. 2

140. If $x < 1$, then

$$\frac{1}{1+x} + \frac{2x}{1+x^2} + \frac{4x^3}{1+x^4} + \ldots\ldots\infty =$$

1. x 2. $\frac{1}{1+x}$ 3. $\frac{1}{1-x}$ 4. $\frac{1}{x}$

141. If $f(x) = Cos(x^2 - 2[x])$ for $0 < x < 1$ then $f^1\left(\frac{\sqrt{\pi}}{2}\right)$

1. $-\sqrt{\frac{\pi}{2}}$ 2. $-\sqrt{\pi}$ 3. $\sqrt{\frac{\pi}{2}}$ 4. $\sqrt{\pi}$

142. $\frac{d}{dx}\log[\tan\{\tan^{-1}(\sinh x)\}] =$

1. Sinh 2x 2. cot hx
3. coth 2x 4. - Sin h 2x

143. Let $f^1(1) = 2$ and $f(1) = 4$, then the derivative of $\log[f(e^x)]$ at the point $x = 0$ is equal to

1. 2 2. 1 3. 1/4 4. $\frac{1}{2}$

144. If $f(x) = (x-1)(x-2)(x-3)$ then $f^1(0)$ is equal to

1. 0 2. 1 3. 6 4. 11

145. If $f(x) = |x^2 - 5x + 6|$ then $f^1(2+)$ is

1. 0 2. 1 3. -1 4. 2

146. If $f(x) = \begin{cases} x\log\cos x \; for & x \neq 0 \\ 0 & for\; x = 0 \end{cases}$ then $f^1(0)$

1. 0 2. -1/2 3. $\frac{1}{2}$ 4. 1

147. If $Cos\left(\frac{x}{2}\right)\cos\frac{x}{2^2}\cos\frac{x}{2^3}\ldots\ldots\infty = \frac{\sin x}{x}$ then

$$\frac{1}{2}Tan\left(\frac{x}{2}\right) + \frac{1}{2^2}Tan\left(\frac{x}{2^2}\right) + \frac{1}{2^3}Tan\left(\frac{x}{2^3}\right)\ldots\infty$$

1. $\frac{x\cot x - 1}{x}$ 2. cot x

3. $\frac{x\tan x - 1}{x}$ 4. Tan x

148. If $Sin\theta\; Sin(2\alpha+\theta)Sin(4\alpha+\theta)\ldots\ldots$ $\text{Sin}(2(n-1)\alpha+\theta) = \sin n\theta / 2^{n-1,}$ where $2n\alpha = \pi$ then $Cot(\theta) + Cot(2\alpha+\theta) + Cot(4\alpha+\theta) + \ldots\ldots + Cot(2(n-1)\alpha+\theta) =$

1. - n cot $n\theta$ 2. n cot $n\theta$
3. n tan $n\theta$ 4. - n tan $n\theta$

149. It is given that $f(x)=[Tan\pi/4+Tan\,x].[Tan\pi/4+Tan(\pi/4-x)]$ and g (x) = x (x + 1). then thevalue of $g^1[f(x)]$ is equal to

1. $\frac{1}{1+x^2}$ 2. 4
3. 0 4. $\frac{2x}{1+x^2}$

150. $\frac{d}{dx}\left[\log\left(x+\sqrt{x^2-1}\right)+\cos ec^{-1}x\right]=$

1. $\frac{1}{x\sqrt{\frac{x+1}{x-1}}}$ 2. $\frac{1}{x\sqrt{\frac{x-1}{x+1}}}$
3. $\frac{1}{x\sqrt{\frac{x^2+1}{x^2-1}}}$ 4. 0

151. If $f(x)=\begin{cases}\frac{1-\cos x}{x} & x\neq 0\\ 0 & x=0\end{cases}$ then $f^1(x)$ =

1. 1/2 2. 1/4
3. 3 4. Does not exist

152. If $f(x)=\begin{cases}\frac{x\left(e^{1/x}-1\right)}{e^{1/x}+1} & x\neq 0\\ 0 & x=0\end{cases}$ then $Rf^1(0)$ (or) the right derivative of f at x = 0

1. 1 2. -1
3. 2 4. Does not exists

153. $f(x)=\begin{cases}\frac{x}{1+e^{1/x}} & x\neq 0\\ 0 & x=0\end{cases}$ then the left derivative of f (x) at x = 0 is (or) $f^1(0-)$

1. 1 2. - 1
3. 0 4. Does not exists

154. $f(x)=\begin{cases}x & x<1\\ 3-x & 1\le x\le 3\end{cases}$ then $f^1(x)$ =

1. 2 2. 0
3. -1 4. Does not exists

155. f(x) = |x - 1| + |x - 3| then $f^1(2)$ =

1. -2 2. 2 3. 0 4. 1

156. If $f(x)=\begin{cases}x^n Cos\frac{1}{x} & if\quad x\neq 0\\ 0 & if\quad x=0\end{cases}$ and n > 0, then f (x) is differentiable at x = 0 if

1. $n\in(0,1)$ 2. $n\in(0\quad 1]$
3. n = 1 4. $n\in(1\quad\infty)$

157. If f (x + y) = f (x) f (y) $\forall x.\ y\in R$ and $f'(0)=5, f(2)=6$ then f^1 (2)

1. 10 2. 20 3. 30 4. 40

158. If f (x) = |x| + |x - 1| is not derivable at x =

1. -1 2. 1 3. 2 4. 3

159. If $\Delta_1=\begin{vmatrix}x & a & a\\ b & x & a\\ b & b & x\end{vmatrix}$ and $\Delta_2=\begin{vmatrix}x & a\\ b & x\end{vmatrix}$ then

1. $\frac{d}{dx}(\Delta_1)=\Delta_2$ 2. $\frac{d}{dx}(\Delta_1)=3\Delta_2$
3. $\frac{d}{dx}(\Delta_1)=2\Delta_2$ 4. 0

160. The function $y=\sin^{-1}$ (cosx) is not differentiable at

1. $x=\pi$ 2. $x=-2\pi$
3. $x=2\pi$ 4. All the above

161. The set of all points when the function $f(x)=\sqrt{1-e^{-x^2}}$ is differentiable is

1. $(0,\infty)$ 2. $(-\infty,\infty)$
3. $(-\infty,\infty)-\{0\}$ 4. $(-1,\infty)$

162. Let f (x) = x - [x] then $f^1(x)=1$

1. $\forall\ x\in R$ 2. $\forall\ x\in R-\{0\}$
3. $\forall\ x\in R-z$ 4. $\forall\ x\in R$

163. The value of $3f(x)-2f\left(\frac{1}{x}\right)=x$ then $f^1(2)=$

1. $\frac{2}{7}$ 2. $\frac{1}{2}$ 3. 2 4. $\frac{7}{2}$

164. If x + 4 |y| = 6y then y as a function of x is

1. Contunuous at x = 0
2. Derivable at x = 0
3. $\frac{dy}{dx}=\frac{1}{2}$ for all x 4. y = 2x

KEY

1. 1	2. 4	3. 1	4. 1
5. 2	6. 2	7. 4	8. 4
9. 1	10.1	11. 4	12. 3
13. 1	14. 2	15.2	16. 3
17. 2	18. 2	19. 1	20.2
21. 2	22. 4	23. 1	24. 1
25.1	26. 3	27. 1	28. 4
29. 4	30.3	31. 2	32. 2
33. 2	34. 1	35.3	36. 4
37. 2	38. 1	39. 1	40.2
41. 2	42. 1	43. 3	44. 2
45.2	46. 1	47. 1	48. 3
49. 2	50.1	51. 3	52. 3
53. 1	54. 1	55.2	56. 2
57. 1	58. 4	59. 2	60.4
61. 4	62. 2	63. 4	64. 1
65.1	66. 1	67. 2	68. 1
69. 4	70. 3	71. 4	72. 1
73. 3	74. 4	75. 4	76. 1
77. 1	78. 2	79. 1	80. 2
81. 1	82. 2	83. 4	84. 1
85. 2	86. 2	87. 1	88. 3
89. 2	90. 3	91. 1	92. 3
93. 2	94. 1	95. 3	96. 2
97. 3	98. 4	99. 2	100. 1
101. 3	102. 3	103. 2	104. 2
105. 1	106. 3	107. 1	108. 2
109. 3	110. 1	111. 2	112. 3
113. 2	114. 1	115. 1	116. 3
117. 1	118. 3	119. 1	120. 4
121. 1	122. 4	123. 2	124. 1
125. 1	126. 3	127. 2	128. 3
129. 2	130. 1	131. 1	132. 1
133. 3	134. 1	135. 1	136. 2
137. 1	138. 3	139.3	140.3
141.1	142.2	143.4	144.4
145.2	146.1	147.1	148.2
149.3	150.1	151.1	152.1
153.1	154.4	155.3	156.4
157.3	158.2	159.2	160.4
161.3	162.3	163.2	164.1

HINTS

Note : F_k stands for k^{th} formula in the synopsis

2. Use F_{45}
4. Use F_{34}
9. Change degrees in terms of radians and use F_9
10. Use F_{43}
13. Use F_{47}
16. $x = 5^{3^{2^y}} \Rightarrow \frac{dy}{dx} = \frac{1}{375 \log_2 \log_3 \log_5}$ x = 125
19. Use F_{47}
21. Use F_{34}
23. Express 'x' as a function of 'y' and use F_5. Finally consider its reciprocal.
24. Express $\sqrt{\sec^2 x + \operatorname{cosec}^2 x} = \frac{2}{\sin 2x}$ and use F_{44}
26. Substitute x=Sin θ and use F_{17}
27. Substitute x=Cos θ and use F_{18}
29. Express $\operatorname{Tan}^{-1}\sqrt{\frac{1-\cos x}{1+\cos x}}$ as $\frac{x}{2}$ and simplify
30. Express $\operatorname{Tan}^{-1}\left(\frac{\cos x}{1+\sin x}\right)$ as $\left(\frac{\pi}{4}-\frac{x}{2}\right)$ and simplify
34. Substitute x=Cos θ which converts $\operatorname{Cos}^{-1}\sqrt{\frac{1+x}{2}}$ as $\frac{1}{2}\operatorname{Cos}^{-1}x$ and simplify
35. $-\frac{1}{4}\operatorname{cseh}^2\frac{x}{2}\left(1-\coth^2\frac{x}{2}\right)$
38. Use $\operatorname{Tan}^{-1}f(x)+\operatorname{Tan}^{-1}\frac{1}{f(x)}=\frac{\pi}{2}$
39. Use F_{46}
40. Use $\operatorname{Sin}^{-1}x+\operatorname{Sec}^{-1}\frac{1}{x}=\frac{\pi}{2}$
42. Use F_{47}
43. Express the function as $\operatorname{Sin}^{-1}y = 2\operatorname{Sin}^{-1}x$ and use F_{17}
45. Using $\operatorname{Tan}^{-1}\left\{\frac{3\alpha-\alpha^3}{1-3\alpha^2}\right\} = 3\operatorname{Tan}^{-1}\alpha$. The function reduces to $3\operatorname{Tan}^{-1}\sqrt{x}$ and use F_{19}.
47. Substitute x=aTan θ
51. Use F_{46}
52. Use $\operatorname{Sin}^{-1}x+\operatorname{Cos}^{-1}x=\frac{\pi}{2}$
53. Substitute $x^p = \tan\theta$ and use F_{19}
54. Express $\operatorname{Tan}^{-1}\left(\frac{4\sqrt{x}}{1-4x}\right) = 2\operatorname{Tan}^{-1}\left(2\sqrt{x}\right)$ and use F_{47}
63. Express $\operatorname{Tan}^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ as $\frac{1}{2}\operatorname{Tan}^{-1}x$ and differentiate w.r.t. $\operatorname{Tan}^{-1}x$.

66. Express $\frac{\tan x-\cot x}{\tan x+\cot x}$ as -Cos2x and use F_9

74. Use F_7

76. Use F_{38}

79. Use F_{34}.

82. Use F_{48}

87. Substitute x=Tan θ which reduces

$\mathrm{Sin}^{-1}\left(2x\sqrt{1-x^2}\right)$, $\mathrm{Tan}^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ as

2Tan^{-1}x, 3Tan^{-1}x respectively and use F_{52}.

94. Let x = a sin α, y = a sin β

96. Use F_6.

103. Substitute $\frac{e^x-e^{-x}}{e^x+e^{-x}}$ =Tanhx and use F_{17}.

104. Use F_{35}.

107. Cubing on both sides and differentiating w.r.t. 'x'.

111. Use F_{49}

114. Express

$\mathrm{Sin}^{-1}\left(\frac{a\mathrm{Cos}x+b\mathrm{Sin}x}{\sqrt{a^2+b^2}}\right)$ as $x+\mathrm{Sin}^{-1}\left(\frac{a}{\sqrt{a^2+b^2}}\right)$

and simplify

116. Use L'hospital's rule.

118. Evaluate $\underset{x\to1}{\mathrm{Lt}}\, f(x)$ and $\underset{x\to1}{\mathrm{Lt}}\,\frac{f(x)-f(1)}{x-1}$

125. Use F_{42}

128. Express the function as -log(1+x) and use F_{42}

132. Use F_{36}

136. Use F_{39}.

137. Use F_{36}

139. Let $\cos^{-1}x=\theta \quad y=\frac{\theta}{2};\frac{dy}{d\theta}=\frac{1}{2}$

140.

$$\frac{dy}{dx}\left[\int\frac{1}{1+x}+\frac{2x}{1+x^2}+\frac{4x^3}{1+x^4}+.....\infty\right]=\frac{d}{dx}-[-\log(1-x)]$$

141. $f(x)=\cos x^2$

142. $\tan^{-1}(\sinh x)=\cot^{-1}(\mathrm{cseh}x)$

145. $f(x)=-x^2+5x-6$

146. $f^1(0)=\underset{x\to0}{\mathrm{Lt}}\frac{f(x)-f(0)}{x}$

147. Apply logarithams and differentiate

149. f(x) = 2

154. $f^1(\bar{1})\neq f^1(1^+)$

156. $f^1(x)=\underset{x\to0}{\mathrm{Lt}}\, x^{n-1}\cos\frac{1}{x}$

LEVEL - III

1. If y= $\frac{\sqrt{x^2+1}+\sqrt{x^2-1}}{\sqrt{x^2+1}-\sqrt{x^2-1}}$ then $\frac{dy}{dx}$ - 2x=

1. $\frac{x^3}{\sqrt{x^4-1}}$ 2. $\frac{2x^3}{\sqrt{x^4+1}}$ 3. $\frac{2x^3}{\sqrt{x^4-1}}$ 4. $\frac{2x^2}{\sqrt{x^4-1}}$

2. If $x^m.y^n=(x+y)^{m+n}$ then $\frac{dy}{dx}$ =

1. $\frac{x}{y}$ 2. xy 3. $\frac{-x}{y}$ 4. $\frac{y}{x}$

3. If $x\sqrt{1+y}+y\sqrt{1+x}$ =0 and x $\neq$ y then $\frac{dy}{dx}$ =

1. $\frac{x+1}{(1-x)^2}$ 2. $\frac{1}{(1-x)^2}$ 3. $\frac{-1}{(1+x)^2}$ 4. $\frac{1}{(1+x)^2}$

4. If $\sqrt{1-x^2}+\sqrt{1-y^2}$ =a(x-y) then $\frac{dy}{dx}$ =

1. $\sqrt{\frac{1-x^2}{1-y^2}}$ 2. $\sqrt{(1-x^2)(1-y^2)}$

3. $\sqrt{\frac{1-y^2}{1-x^2}}$ 4. $\frac{1}{\sqrt{(1-x^2)(1-y^2)}}$

5. If $y\sqrt{1-x^2}+x\sqrt{1-y^2}$ =1 then $\frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}$ =

1. 1 2. $\frac{-1}{2}$ 3. 0 4. -1

6. $\frac{d}{dx}\left[\sqrt{\tan\sqrt{1+x^2}}\right]$ =

1. $\frac{x\sec^2\sqrt{1+x^2}}{2\sqrt{(1+x^2)\tan\sqrt{1+x^2}}}$

2. $\frac{x\sec^2\sqrt{1+x^2}}{2(1+x^2)\sqrt{\tan\sqrt{1+x^2}}}$

3. $\frac{x\sec^2\sqrt{1+x^2}}{2\sqrt{(1+x^2)\tan(1+x^2)}}$ 4. $\frac{x\sec^2\sqrt{1+x^2}}{\sqrt{\tan(1+x^2)}}$