Topic :-DIFFERENTITATION

1. Find $\frac{dy}{dx}$, if $x = 2\cos\theta - \cos 2\theta$ and $y = 2\sin\theta - \sin 2\theta$.

   a) $\tan\frac{3\theta}{2}$ b) $-\tan\frac{3\theta}{2}$ c) $\cot\frac{3\theta}{2}$ d) $-\cot\frac{3\theta}{2}$

2. Let $f(x) = 2^{2x-1}$ and $\phi(x) - 2^x + 2x \log 2$. If $f'(x) > \phi'(x)$, then

   a) $0 < x < 1$ b) $0 \le x < 1$ c) $x > 0$ d) $x \ge 0$

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

   a) $\frac{1}{(1+x)^2}$ b) $-\frac{1}{(1+x)^2}$ c) $\frac{1}{1+x^2}$ d) $\frac{1}{1-x^2}$

4. If $y = e^{(1/2)\log(1+\tan^2 x)}$, then $\frac{dy}{dx}$ is equal to

   a) $\frac{1}{2}\sec^2 x$ b) $\sec^2 x$

   c) $\sec x \tan x$ d) $e^{1/2 \log(1+\tan^2 x)}$

5. If $f(x) = \frac{x-1}{4} + \frac{(x-1)^3}{12} + \frac{(x-1)^5}{20} + \frac{(x-1)^7}{28} + ...$, where $0 < x < 2$, then $f'(x)$ is equal to

   a) $\frac{1}{4x(2-x)}$ b) $\frac{1}{4(x-2)^2}$ c) $\frac{1}{2-x}$ d) $\frac{1}{2+x}$

6. If $f(x) = \begin{vmatrix} x^3 & x^2 & 3x^2 \\ 1 & -6 & 4 \\ P & P^2 & P^3 \end{vmatrix}$, here p is a constant, then $\frac{d^3 f(x)}{dx^3}$ is

   a) Proportional to x^2 b) Proportional to x
   c) Proportional to x^3 d) A constant

7. If $f(x) = \arctan\left(\frac{x^x - x^{-x}}{2}\right)$, then $f'(1)$ is equal to

   a) 1   b) -1 c) $\log 2$ d) None of these

8. If for all $x, y \in R$, the function f is defined by $f(x) + f(y) + f(x)f(y) = 1$ and $f(x) > 0$. Then,
   a) $f'(x) = 0$ for all $x \in R$
   b) $f'(0) < f'(1)$
   c) $f'(x)$ does not exist
   d) None of these

9. Let $f(x) = e^x$, $g(x) = \sin^{-1} x$ and $h(x) = f[g(x)]$, then $\frac{h'(x)}{h(x)}$ is equal to

a) $e^{\sin^{-1} x}$

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

c) $\sin^{-1} x$

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

10. If $f(x,y) = \frac{\cos(x-4y)}{\cos(x+4y)}$, then $\frac{\partial f}{\partial x}\Big|_{y=\frac{\pi}{2}}$ is equal to

a) -1

b) 0

c) 1

d) 2

11. If $y = \sin^n x \cos nx$, then $\frac{dy}{dx}$ is

a) $n \sin^{n-1} x \sin(n+1)x$

b) $n \sin^{n-1} x \cos(n-1)x$

c) $n \sin^{n-1} x \cos nx$

d) $n \sin^{n-1} x \cos(n+1)x$

12. If $2f(x) = f'(x)$ and $f(0) = 3$, then $f(2)$ is equal to

a) $3e^4$

b) $3e^2$

c) e^4

d) None of these

13. If $y^2 = P(x)$ is a polynomial of degree 3, then $2\frac{d}{dx}\left[y^3 \frac{d^2y}{dx^2}\right]$ equals

a) $P'''(x) + P'x$

b) $P''(x).P'''(x)$

c) $P(x).P'''(x)$

d) None of these

14. If $e^{y+e^{y+...\infty}}$, $x > 0$, then $\frac{dy}{dx}$ is

a) $\frac{x}{1+x}$

b) $\frac{1}{x}$

c) $\frac{1-x}{x}$

d) $\frac{1+x}{x}$

15. The 2nd derivative of $a\sin^3 t$ with respect to $a\cos^3 t$ at $t = \frac{\pi}{4}$ is

a) $\frac{4\sqrt{2}}{3a}$

b) 2

c) $\frac{1}{12a}$

d) None of these

16. The derivative of $\sin(x^3)$ w.r.t. $\cos(x^3)$ is

a) $-\tan(x^3)$

b) $\tan(x^3)$

c) $-\cot(x^3)$

d) $\cot(x^3)$

17. If $y = \tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$, then $\frac{dy}{dx}$ is equal to

a) $\frac{1}{2}$

b) 2

c) -2

d) $-\frac{1}{2}$

18. If $y = \tan^{-1}\sqrt{\frac{1-\sin x}{1+\sin x}}$, then the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{6}$ is

a) $-\frac{1}{2}$

b) $\frac{1}{2}$

c) 1

d) -1

19. If $y = \log_{\cos x} \sin x$, then $\frac{dy}{dx}$ is equal to

a) $\frac{(\cot x \log \cos x + \tan x \log \sin x)}{(\log \cos x)^2}$

b) $\frac{(\tan x \log \cos x + \cot x \log \sin x)}{(\log \cos x)^2}$

c) $\frac{(\cot x \log \cos x + \tan x \log \sin x)}{(\log \sin x)^2}$

d) None of the above

20. If $y = 2^x.3^{2x-1}$, then $\frac{d^2y}{dx^2}$ is equal to

a) $(\log 2)(\log 3)$ b) $(\log 18)$ c) $(\log 18^2)y^2$ d) $(\log 18)^2 y$