Topic :- DIFFERENTITATION

1. If $y = \dfrac{\sqrt{1 - \sin x} + \sqrt{1 + \sin x}}{\sqrt{1 - \sin x} - \sqrt{1 + \sin x}}$, then $\dfrac{dy}{dx}$ is equal to

   a) $\dfrac{1}{2}\csc^2\dfrac{x}{2}$　　　　b) $\dfrac{1}{2}\csc\dfrac{x}{2}$　　　　c) $\dfrac{1}{2}\csc^2 x$　　　　d) $\csc^2\dfrac{x}{2}$

2. The value of $\dfrac{dy}{dx}$ at $x = \dfrac{\pi}{2}$, where y is given by $y = x^{\sin x} + \sqrt{x}$, is

   a) $1 + \dfrac{1}{\sqrt{2\pi}}$　　　　b) 1　　　　c) $\dfrac{1}{\sqrt{2\pi}}$　　　　d) $1 - \dfrac{1}{\sqrt{2\pi}}$

3. If $y = \dfrac{3at^2}{1 + t^3}, x = \dfrac{3at}{1 + t^3}$, then $\dfrac{dy}{dx}$ is equal to

   a) $\dfrac{t(2 - t^3)}{(1 - 2t^3)}$　　　　b) $\dfrac{t(2 + t^3)}{(1 - 2t^3)}$　　　　c) $\dfrac{t(2 - t^3)}{(1 + 2t^3)}$　　　　d) $\dfrac{t(2 + t^3)}{(1 + 2t^3)}$

4. If $y = \log_a x + \log_x a + \log_x x + \log_a a$, then $\dfrac{dy}{dx}$ is equal to

   a) $\dfrac{1}{x} + x\log a$　　　　b) $\dfrac{\log a}{x} + \dfrac{x}{\log a}$　　　　c) $\dfrac{1}{x \log a} + x\log a$　　　　d) None of these

5. If $8f(x) + 6f\left(\dfrac{1}{x}\right) = x + 5$ and $y = x^2 f(x)$, then the value of $\dfrac{dy}{dx}$ at $x = -1$, is

   a) 0　　　　b) $\dfrac{1}{14}$　　　　c) $-\dfrac{1}{14}$　　　　d) $\dfrac{1}{7}$

6. If $y = \sqrt{\dfrac{1 - x}{1 + x}}$, then $(1 - x^2)\dfrac{dy}{dx} + y$ is equal to

   a) 1　　　　b) -1　　　　c) 2　　　　d) 0

7. If $x^y = e^{2(x-y)}$, then $\dfrac{dy}{dx}$ is equal to

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

8. If $x = a(1 + \cos\theta), y = a(\theta + \sin\theta)$, then $\dfrac{d^2y}{dx^2}$ at $\theta = \dfrac{\pi}{2}$ is

   a) $-\dfrac{1}{a}$　　　　b) $\dfrac{1}{a}$　　　　c) -1　　　　d) -2

9. If $y^2 = ax^2 + bx + c$, where a, b, c are constants, then $y^3\dfrac{d^2y}{dx^2}$ is equal to

   a) a constant　　　　　　　　　　b) a function of x
   c) a function of y　　　　　　　　d) a function of x and y both

10. If $y = 1 + \frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3} + \ldots\infty$ with $|x| > 1$, then $\frac{dy}{dx}$ is

   a) $\frac{x^2}{y^2}$ b) $x^2 y^2$ c) $\frac{y^2}{x^2}$ d) $-\frac{y^2}{x^2}$

11. If $f(x,y) = 2(x-y)^2 - x^4 - y^4$, then $\left|(f_{xx}f_{yy} - f_{xy}^2)\right|_{0,0}$ is

   a) 32   b) 16   c) 0   d) -1

12. If $y = \left[\tan^{-1}\frac{1}{1 + x + x^2} + \tan^{-1}\frac{1}{x^2 + 3x + 3} + \tan^{-1}\frac{1}{x^2 + 5x + 7} + \ldots + \text{upto } n \text{ terms}\right]$, then $y'(0)$ is

equal to

   a) $\frac{-1}{(n^2 + 1)}$ b) $\frac{-n^2}{(n^2 + 1)}$ c) $\frac{n^2}{(n^2 + 1)}$ d) None of these

13. Given that $\frac{d}{dx}f(x) = f'(x)$. The relationship $f'(a + b) = f'(a) + f'(b)$ is valid, if $f(x)$ is equal to

   a) x b) x^2 c) x^3 d) x^4

14. nth derivative of $(x + 1)^n$ is equal to

   a) $(n - 1)!$ b) $(n + 1)!$ c) $n!$ d) $n[(n + 1)]^{n-1}$

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

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

16. If $y = x^2 + \cfrac{1}{x^2 + \cfrac{1}{x^2 + \cfrac{1}{x^2 + \ldots\infty}}}$, then $\frac{dy}{dx}$ is equal to

   a) $\frac{2xy}{2y - x^2}$ b) $\frac{xy}{y + x^2}$ c) $\frac{xy}{y - x^2}$ d) $\frac{2x}{2 + \frac{x^2}{y}}$

17. If $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$, then $\frac{dy}{dx}$ is equal to

   a) $\operatorname{sech}^2 x$ b) $\operatorname{cosech}^2 x$ c) $-\operatorname{sech}^2 x$ d) $-\operatorname{cosech}^2 x$

18. If $f(x) = |x - 2|$ and $g(x) = f(f(x))$, then for $x > 20$, $g'(x)$ is equal to

   a) -1 b) 0   c) 1   d) 2

19. If $5f(x) + 3f\left(\frac{1}{x}\right) = x + 2$ and $y = x f(x)$, then $\left(\frac{dy}{dx}\right)_{x=1}$ is equal to

   a) 14   b) 7/8   c) 1   d) None of these

20. The differential coefficient of $f(\log x)$, where $f(x) = \log x$ is

   a) $\frac{x}{\log x}$ b) $(x \log x)^{-1}$ c) $\frac{\log x}{x}$ d) None of these