DIFFERENTIATION

1. If $y = \cot^{-1}(\cos 2x)^{1/2}$, then the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{6}$ will be

(a) $\left(\frac{2}{3}\right)^{1/2}$ (b) $\left(\frac{1}{3}\right)^{1/2}$ (c) $(3)^{1/2}$ (d) $(6)^{1/2}$

2. If $y = \frac{5x}{\sqrt[3]{(1-x)^2}} + \cos^2(2x+1)$, then $\frac{dy}{dx} =$

(a) $\frac{5(3-x)}{3(1-x)^{5/3}} - 2\sin(4x+2)$ (b) $\frac{5(3-x)}{3(1-x)^{2/3}} - 2\sin(4x+4)$ (c) $\frac{5(3-x)}{3(1-x)^{2/3}} - 2\sin(2x+1)$ (d) None of these

3. $\frac{d}{dx}\log(\log x) =$

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

4. If $y = \tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}$, then $\frac{dy}{dx}$ is equal to

(a) 0 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) 1

5. $\frac{d}{dx}\cos^{-1}\frac{x-x^{-1}}{x+x^{-1}} =$

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

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

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

7. Function $y = (x+\sqrt{x^2+1})^k$ satisfies

(a) $(x^2+1)y' = k^2y$ (b) $\sqrt{(x^2+1)}y' = ky$ (c) $(1+x^2)y'' + ky' - xy = 0$ (d) $(1+x^2)y'' + k^2 + xy' = 0$

8. If $\sqrt{(1-x^6)} + \sqrt{(1-y^6)} = a^3(x^3-y^3)$, then $\frac{dy}{dx} =$

(a) $\frac{x^2}{y^2}\sqrt{\frac{1-x^6}{1-y^6}}$ (b) $\frac{y^2}{x^2}\sqrt{\frac{1-y^6}{1-x^6}}$ (c) $\frac{x^2}{y^2}\sqrt{\frac{1-y^6}{1-x^6}}$ (d) None of these

9. If $y = f\left(\frac{2x-1}{x^2+1}\right)$ and $f'(x) = \sin x^2$, then $\frac{dy}{dx} =$

(a) $\frac{6x^2-2x+2}{(x^2+1)^2}\sin\left(\frac{2x-1}{x^2+1}\right)^2$ (b) $\frac{6x^2-2x+2}{(x^2+1)^2}\sin^2\left(\frac{2x-1}{x^2+1}\right)$

(c) $\frac{-2x^2+2x+2}{(x^2+1)^2}\sin^2\left(\frac{2x-1}{x^2+1}\right)$ (d) $\frac{-2x^2+2x+2}{(x^2+1)^2}\sin\left(\frac{2x-1}{x^2+1}\right)^2$

10. If $x = \sec\theta - \cos\theta$ and $y = \sec^n\theta - \cos^n\theta$, then

(a) $(x^2+4)\left(\frac{dy}{dx}\right)^2 = n^2(y^2+4)$ (b) $(x^2+4)\left(\frac{dy}{dx}\right)^2 = x^2(y^2+4)$ (c) $(x^2+4)\left(\frac{dy}{dx}\right)^2 = (y^2+4)$ (d) None of these

11. If $y\sqrt{x^2+1} = \log\{\sqrt{x^2+1}-x\}$, then $(x^2+1)\frac{dy}{dx} + xy + 1 =$

(a) 0 (b) 1 (c) 2 (d) None of these

12. $\frac{d}{dx}(a^{\log_{10}\operatorname{cosec}^{-1}x}) =$

(a) $a^{\log_{10}\,\mathrm{cosec}^{-1}x}\cdot\frac{1}{\mathrm{cosec}^{-1}x}\cdot\frac{1}{x\sqrt{x^2-1}}\cdot\log_{10}a$

(b) $-a^{\log_{10}\,\mathrm{cosec}^{-1}x}\cdot\frac{1}{\mathrm{cosec}^{-1}x}\cdot\frac{1}{|x|\sqrt{x^2-1}}\cdot\log_{10}a$

(c) $a^{\log_{10}\,\mathrm{cosec}^{-1}x}\cdot\frac{1}{\mathrm{cosec}^{-1}x}\cdot\frac{1}{|x|\sqrt{x^2-1}}\cdot\log_{10}a$

(d) $-a^{\log_{10}\,\mathrm{cosec}^{-1}x}\cdot\frac{1}{\mathrm{cosec}^{-1}x}\cdot\frac{1}{x\sqrt{x^2-1}}\cdot\log_{10}a$

13. If $y=\tan^{-1}\left\{\frac{3a^2x-x^3}{a(a^2-3x^2)}\right\}$ then $\frac{dy}{dx}$ equals

(a) $\frac{3}{a^2+x^2}$ (b) $\frac{a}{a^2+x^2}$ (c) $\frac{3a}{a^2+x^2}$ (d) $\frac{3x}{a^2+x^2}$

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

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

15. If $y=\frac{2(x-\sin x)^{3/2}}{\sqrt{x}}$, then $\frac{dy}{dx}=$

(a) $\frac{2(x-\sin x)^{3/2}}{\sqrt{x}}\left[\frac{3}{2}\cdot\frac{1-\cos x}{1-\sin x}-\frac{1}{2x}\right]$

(b) $\frac{2(x-\sin x)^{3/2}}{\sqrt{x}}\left[\frac{3}{2}\cdot\frac{1-\cos x}{x-\sin x}-\frac{1}{2x}\right]$

(c) $\frac{2(x-\sin x)^{1/2}}{\sqrt{x}}\left[\frac{3}{2}\cdot\frac{1-\cos x}{x-\sin x}-\frac{1}{2x}\right]$

(d) None of these