Quality Checkers Only way to fulfill your dreams	12th Science-: Maths Differentiation	**DATE:** **TIME: 1 Hours** **MARKS: 25** SEAT NO:

Note:-

1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

Section A

Q.1 Select and write the correct answer. **(4)**

1. If $x^y = y^x$, then $\frac{dy}{dx}$ = ...

   A) $\frac{x\ (x\log y - y)}{y\ (y\log x - x)}$ B) $\frac{y\ (y\log x - x)}{x\ (x\log y - y)}$

   C) $\frac{y^2\ (1 - \log x)}{x^2\ (1 - \log y)}$ D) $\frac{y\ (1 - \log x)}{x\ (1 - \log y)}$

2. If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$ then $\left[\frac{d^2y}{dx^2}\right]_{\theta = \frac{\pi}{4}}$ = ...

   A) $\frac{8\sqrt{2}}{a\pi}$ B) $-\frac{8\sqrt{2}}{a\pi}$

   C) $\frac{a\pi}{8\sqrt{2}}$ D) $\frac{4\sqrt{2}}{a\pi}$

Q.2 Answer the following. **(3)**

1. Find $\frac{dy}{dx}$ if $x = \sin\theta$, $y = \tan\theta$
2. Differentiate $5\sin^3 x + 3$ w.r.t. x
3. Differentiate the $\tan^{-1}(\log x)$ w. r. t. x

Section B
Attempt any Four

Q.3 Differentiate $\frac{(x^2 + 2)^4}{\sqrt{x^2 - 5}}$ w.r.t.x **(2)**

Q.4 Differentiate $\cos^{-1}\left(\frac{3\cos(e^x) + 2\sin(e^x)}{\sqrt{13}}\right)$ w.r.t.x. **(2)**

Q.5 If $y = A\cos(\log x) + B\sin(\log x)$, show that $x^2y_2 + xy_1 + y = 0$ **(2)**

Q.6 Differentiate $(x^2 + 4x - 1)^3 + (x^3 - 5x - 2)^4$ w.r.t.x **(2)**

Q.7 Differentiate $\left(\frac{2x^{\frac{5}{2}}}{1 - x^6}\right)$ w.r.t.x **(2)**

Q.8 Differentiate $\log_{e^2}(\log x)$ w.r.t.x **(2)**

Section C
Attempt any Two

Q.9 Differentiate $\cos^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1+x}}{2}\right)$ w.r.t.x **(3)**

Q.10 Differentiate $\tan^{-1}(\text{cosec } x + \cot x)$ w. r. t. x **(3)**

Q.11 Differentiate $\cot^{-1}\left(\frac{a^2-6x^2}{5ax}\right)$ w.r.t.x **(3)**

Section D
Attempt any One

Q.12 Differentiate $\tan^{-1}\left[\sqrt{\frac{\sqrt{1+x^2}+x}{\sqrt{1+x^2}-x}}\right]$ w.r.t.x **(4)**

Q.13 If $x = a\cos\theta,\ y = b\sin\theta,$ show that $a^2\left[y\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2\right]+b^2=0$ **(4)**