

Questions 1 - 4 are of 1 mark each.
 Questions 5 - 9 are of 2 marks each.
 Questions 10 & 11 are of 3 marks each.

1. Evaluate : $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$.
2. Differentiate : $y = \sqrt{e^{\sqrt{x}}}$ with respect to x .
3. Differentiate : $\tan^{-1}\sqrt{x}$ with respect to $x + \frac{x^2}{2}$.
4. Simplify: $\sin(2\cos^{-1}x + \sin^{-1}x)$.
5. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, prove $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$.
6. Find K so that function $f(x)$ is continuous at $x = \frac{\pi}{2}$, where $f(x) = \begin{cases} k\cos x & x \neq \pi/2 \\ \pi - 2x & x = \pi/2 \end{cases}$.
7. Simplify : $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{1+x}\right)$.
8. Verify Rolle's theorem for $f(x) = \{\log(x^2+2) - \log 3\}$ in $-1 \leq x \leq 1$.
9. If $y = x^x + x^p + p^x + a^b$, find $\frac{dy}{dx}$, where a, p, b are constants.
10. Prove $2\tan^{-1}\left(\sqrt{\frac{a-b}{a+b}} \tan \frac{\theta}{2}\right) = \cos^{-1}\left(\frac{a \cos \theta + b}{a + b \cos \theta}\right)$
11. If $x = a(1-\cos\theta)$, $y = a(\theta+\sin\theta)$. Show $y_2 = \frac{-1}{4a} \sec\left(\frac{\theta}{2}\right) \operatorname{cosec}^3\left(\frac{\theta}{2}\right)$.

-x-x-x-x-x-