Differentiation

October 26, 2023

1. The slope of the normal to the curve $y = 2x^2 + 3\sin x$ at $x = 0$ is _____.

   The total revenue (in ₹) received from sale of x units of a product is $R(x) = 3x^2 + 36x + 5$. The marginal revenue, when $x = 12$ is _____.

2. If $siny = xsin(a + y)$, then prove that $\frac{dy}{dx} = \frac{sinx^2(a+y)}{\sin a}$.

3. Find the equation of tangent to the curve $y = x^2 + 4x + 1$ at the point(3,22).

4. If $Y = \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$, $-\frac{1}{\sqrt{3}} <$x$< \frac{1}{\sqrt{3}}$ then find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

5. If $\sec^{-1}\left(\frac{1+x}{1-y}\right) = a$, then $\frac{dy}{dx}$ is equal to

6. The oder and degree of the differential equation of the family of parabolas having at organ and axis along positive x-axis is

7. If $y = \log x$, then $\frac{d^2y}{dx^2} =$

8. Find the intervals in which the function f defined as $f(x) = \sin(x) + \cos(x)$, $0 \leqslant x \leqslant 2\pi$ is strictly increasing or decreasing.

   Prove that the radius of the right circular cylindar of greatest curved surface area which can be inscribed in a given cone is half of thatof the cone.

9. If $y = x^{\sin x} + \sin^{-1}(\sqrt{x})$, the find $\frac{dy}{dx}$.

10. The supply function of a commodity is $100p = (x + 20)^2$. Find the Producer's Surplus(PS),whne the market price is ₹25.

OR

Find:

$\int \frac{2x^2+1}{x^2-3x+2} dx$