BRAIN INTERNATIONAL SCHOOL

SUBJECT : MATHEMATICS CLASS : XII JUNE 2021

CHAPTER : APPLICATIONS OF DERIVATIVES

Q1. For the curve $y = 3x^2 + 4x$, find the slope of the tangent to the curve at the point whose x-coordinate is –2.

Q2. The amount of pollution content added in air in a city due to x-diesel vehicles is given by $P(x) = 0.005x^3 + 0.02x^2 + 30x$. Find the marginal increase in pollution content when 3 diesel vehicles are added and write which value in indicated in the above question.

Q3. The volume of a sphere is increasing at the rate of 3 cubic centimeter per second. Find the rate of increase of its surface area, when the radius is 2 cm.

Q4. The volume of a cube is increasing at the rate of 9 cm^3/s. How fast is its surface area increasing when the length of an edge is 10 cm?

Q5. Show that the function $f(x) = 4x^3 - 18x^2 + 27x - 7$ is always increasing on R.

Q6. Show that the function $f(x) = x^3 - 3x^2 + 6x - 100$ is increasing on R.

Q7. Find the intervals in which the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is

(i) Strictly increasing
(ii) Strictly decreasing

Q8. Find the equation of the tangent and normal to the curve $x = a\ sin^3\theta$ and $y = a\ cos^3\theta$ at $\theta = \frac{\pi}{4}$.

Q9. Using differentials, find the approximate value of $\sqrt{49.5}$.

Q10. A ladder 5 m long is leaning against a wall. The bottom of the ladder is pulled along the ground, away from the wall, at the rate of 2 cm/s. How fast is its height on the wall decreasing when the foot of the ladder is 4 m away from the wall?

Q11. Find the intervals in which $f(x) = \sin 3x - \cos 3x, 0 < x < \pi$, is strictly increasing or strictly decreasing.

Q12. Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius r is $\frac{4r}{3}$. Also find maximum volume in terms of volume of the sphere.

Q13. If the sum of lengths of the hypotenuse and a side of a right angled triangle is given, show that the area of the triangle is maximum, when the angle between them is $\frac{\pi}{3}$.

Q14. Prove that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume.