JAGRAN SOCIAL WELFARE SOCIETY

Delhi Public School
Kolar Road Bhopal

ASSIGNMENT [No. – 5] 2018 – 2019
CLASS : XII
SUBJECT : MATHEMATICS

Issue Date :_____ **Submission Date :_____**

Name: _____ Roll No_____ Class_____ Sec_____

CHAPTER 5 : CONTINUITY AND DIFFERENTIABILITY

Q.1 Find $\frac{dy}{dx}$ if $y = \sin(\tan^{-1} e^{-x})$

Q.2 Find all the points of discontinuity of the function 'f' defined by

$$f(x) = \begin{cases} |x|+3 & \text{if } x \le -3 \\ -2x & \text{if } -3 < x < 3 \\ 6x+2 & \text{if } x \ge 3 \end{cases}$$

Q.3 Test the differentiability of $|x-1|$ at $x=1$.

Q.4 Discuss the continuity of function

$$f(x) = \begin{cases} \frac{\sin 2x}{3x}, & x \neq 0 \\ \frac{3}{2}, & x = 0 \end{cases} \text{ at } x = 0 .$$

Q.5 Find 'k' if the function is continuous

$$f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & x \neq \frac{\pi}{2} \\ 3, & x = \frac{\pi}{2} \end{cases} \quad at \ \frac{\pi}{2}$$

Q.6 For what choice of a and b is the function

$$f(x) = \begin{cases} x^2, & x \le c \\ ax + b, & x > c \end{cases} \quad \text{differentiable at } x = c.$$

Q.7 Differentiate the following w.r.t.x :

(i) $\sin(e^x \log x)$

(ii) $\log\left[\tan\left(\frac{\pi}{4} + \frac{x}{2}\right)\right]$

(iii) $\sqrt{\frac{1-\tan x}{1+\tan x}}$

(iv) $\frac{\log\left(x+\sqrt{x^2+1}\right)}{\sqrt{x^2+1}}$

(v) $\sqrt{\frac{1+e^x}{1-e^x}}$

(vi) $\text{Log}(\sec x + \tan x)$

(vii) $\sqrt{\frac{1-\cos 2x}{1+\cos 2x}}$

(viii) $e^x \sin x + 2^x \operatorname{cosec} x + x^n \log x$

(ix) $\sin\left(\sqrt{\sin x + \cos x}\right)$

(x) $e^{ax} \cos(bx + c)$

APPLICATIONS OF DERIVATIVES

Q.1 Sand is pouring from a pipe at the rate of 12cm3/s. The falling sand forms a cone on the ground in such a way that the height of the cone is always one sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4cm?

Q.2 Find the equations of tangent and normal to the parabola $y^2 = 4x$ at the point $(at^2, 2at)$

Q.3 Find the equation of the normal to the curve $x^2 = 4y$ which passes through the point (1, 2).

Q.4 . Find the intervals in which following functions are strictly increasing or strictly decreasing:

i. $-2x^3 - 9x^2 - 12x + 1$

ii. $(x+1)^3\ (x-3)^3$

iii $x^3+\frac{1}{x^3}, x\neq 0$

iv $4x^3 - 6x^2 - 72x + 30$

v $f(x) = \sin x + \cos x,\ 0 \le x \le 2\pi$

Q.5 Find the point(s) on the curve $y = 5x^2 - 2x^3$ at which the tangent is parallel to the line $y - 4x = 5$

Q.6 Use differentiation to approximate $(25)^{\frac{1}{3}}$.

Q.7 Find point on the curve $\frac{x^2}{4} + \frac{y^2}{25} = 1$ at which the tangents are
(i) parallel to x –axis (ii) parallel to y – axis.

Q.8 Find the equations of the tangent and normal to curve $x^{2/3}+y^{2/3}=2$ at (1,1).

Q.9 If the radius of a sphere is measured as 9cm with an error of 0.03cm, then find the approximate error in calculating its volume.

Q.10 Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius R is 4R/3.

Q.11 Show that the volume of the greatest cylinder which can be inscribed in a cone of height 'h' and semi vertical angle $\propto$ is $\frac{4}{27}\pi h^3 \tan^2\alpha$.

Q.12 If the length of three sides of a trapezium other than base are equal to 10 cm, then find the area of the trapezium when it is maximum.

Q.13 A jet of an enemy is flying along the curve $y = x^2+2$. A soldier is placed at the point (3, 2). What is the nearest distance between the soldier and the jet?

Q.14 A given quantity of metal is to be cast into a half cylinder with a rectangular base and semicircular ends. Show that in order that the total surface area be minimum the ratio of length Of the cylinder to the diameter of its semicircular ends is $\pi : (\pi + 2)$.

Q.15 A window in the form of a rectangle is surmounted by a semi circular opening. The total perimeter of the window is 30 metres. Find the dimensions of the rectangular part of the window to admit maximum light through the whole opening.

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