



# ALALIA INTERNATIONAL INDIAN SCHOOL, RIYADH

CLASS: **XII**

## WORKSHEET 2017-18

SUB: **MATHEMATICS**

UNIT/ CONTENT - **APPLICATION OF DERIVATIVES**

### 1 Mark Questions

- Q1 How will you interpret geometrically  $\frac{dy}{dx}$  of a function at a point  $(x_0, y_0)$
- Q2 Find the rate of change of area of a circle with respect to its radius 'r' when  $r = 5$  cm.
- Q3 The total cost  $C(x)$  in rupees, associated with the production of  $x$  units of an item is given by  $C(x) = 0.005x^2 - 0.002x + 5000$ . Find the marginal cost when only two items are produced.
- Q4 Total revenue in selling  $x$  units of a product is given by  $R(x) = 3x^2 + 36x + 5$ . Find the marginal revenue when  $x = 5$ .
- Q5 Show that function  $f(x) = 2x - 1$  is strictly increasing on  $\mathbb{R}$ .
- Q6 Write the condition for a function  $f$  to be strictly increasing. {  
 $f'(x) > 0, \forall x \in D_f$   
}
- Q7 Write the condition for a function  $f$  to be strictly decreasing. {  
 $f'(x) < 0, \forall x \in D_f$   
}
- Q8 Show that function  $f(x) = \cos x$  is strictly increasing on  $(\pi, 2\pi)$ .
- Q9 Show that function  $f(x) = \cos x$  is strictly increasing on  $(0, \pi)$ .
- Q10 Show that function  $f(x) = \cos x$  is neither increasing nor decreasing on  $(0, 2\pi)$ .
- Q11 Find the point of inflection for the function  $f(x) = x^3$ .
- Q12 Find the intervals in which the function  $f(x) = x^2 - 2x$  is strictly increasing.
- Q13 Find the intervals in which the function  $f(x) = x^2 - 2x$  is strictly decreasing.
- Q14 Write the domain of the function  $f(x) = \log(1+x) - \frac{2x}{1+x}$ .
- Q15 Find the slope of the tangent to the curve  $y = x^3 - x + 1$  at the point where the curve cuts y-axis.

### 4 Mark Questions

- Q1 Prove that the curves  $x = y^2$  and  $x, y = k$  cut each other at right angle if  $8.k^2 = 1$ .
- Q2 Find the points on the curve  $x^2 + y^2 - 2x - 3 = 0$  at which tangents are parallel to x-axis.

**Q3 Find the points on the curve  $y = x^3$  at which tangent makes angle of  $45^\circ$  to x-axis**

$$\left(\frac{1}{\sqrt{3}}, \frac{1}{3\sqrt{3}}\right), \left(-\frac{1}{\sqrt{3}}, -\frac{1}{3\sqrt{3}}\right)$$

**Q4 Find the points on the curve  $y = x^3$  at which slope of the tangent is equal to the ordinate of the point.**

**Q5 Find the points on the curve  $x^2 + 3y = 3$  where the tangent is perpendicular to the line  $4y + x = -5$ .**

**Q6 Find the equation of tangent to the curve  $16x^2 + 9y^2 = 144$  at the point  $(x_1, y_1)$  where  $x_1 = 2$  and  $y_1 > 0$ .**

**Q7 Find the least value of 'b' for which  $f(x) = x^2 + bx + 1$  is an increasing on  $[1, 2]$**

**Q8 Find the points of local max. and local min. for the function. Also find their max. / minimum values  $y = \sin x - \cos x, 0 \leq x \leq 2\pi$**

**Q9 Find the absolute maximum and absolute minimum values of the function  $f(x) = 2 \cos 2x - \cos 4x$ , on  $[0, \pi]$**

**Q10 If  $f(x) = x^3 + ax^2 + bx + c$  has a maximum at  $x = -1$  and minimum at  $x = 3$ . Show that  $a = -3, b = -9, c \in \mathbb{R}$**

**Q11 A given rectangular area is to be fenced off in a field whose length lies along a straight river. If no fencing is required along the river show that least amount of fencing will be required when length of the field is twice its breadth.**

**Q12 Find the angle  $x$  which is increasing twice as fast as its sine.**

**Q13 Using differential, find the approximate value of  $\tan^{-1}(0.999)$ .**

**Q14 If  $y = x^4 - 10$  and if  $x$  changes from 2 to 1.99, find the approximate change in  $y$ .**

**Q15 If the side of a cube is increased from 10 cm to 10.01 cm.. Find approximate change in the volume of the cube.**

### 6 Mark Questions

**Q1 Find the equation of tangent to the curve  $y = \cos(x + y)$ ,  $-2\pi \leq x \leq 2\pi$  that are parallel to the line  $x + 2y = 0$ .**

**Q2 Find the points on the curve  $y = 4x^3 - 2x^5$  at which tangent passes through the origin.**

- Q3** Find the angle of intersection of the curves  $y = x^2$  &  $x^2 + y^2 = 20$
- Q4** Find the intervals in which following functions are strictly increasing or strictly decreasing  $f(x) = x^x, x > 0$ .
- Q5** Find the intervals in which following functions are strictly increasing or strictly decreasing  $f(x) = (x + 1)^3(x - 3)^3$
- Q6** Find the absolute maximum and absolute minimum values of the function  $f(x) = -x + 2\sin x$  on  $[0, 2\pi]$
- .....

**Q7** A jet of an enemy is flying along the curve  $y = x^2 + 2$  . A soldier is placed at the point (3, 2) . Find the nearest distance between the soldier and the jet.

**Q8** An open box with a square base is to be made out of a given quantity of sheet of area  $c^2$  .Show that the maximum volume of the box is

$$c^3 / 6\sqrt{3}.$$

**Q9** A sheet of paper for a poster is 15000 sq. cm. in area. The margins at the top and bottom are to be 6 cm. wide and at the sides 4 cm. wide. Find the dimensions of the sheet to maximize the printed area.

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