Chapter-6  
Application of Derivatives

1. The radius of a circle is increasing at a uniform rate of 3cm/sec. At the instant when the radius of the circle is 2cm, its area increases at the rate of \_\_\_\_ .
2. The volume of a sphere is increasing at a rate of 3 cubic cm per second. Find the rate of increase of its surface area, when the radius is 2 cm.
3. Find the velocity and acceleration at the end of 2 seconds of the particle moving according to the rule.
4. Find the rate of change of the area of a circle with respect to its radius when cm.
5. A stone is dropped into a quiet lake and waves move in circles at a speed of 4 cm per second. At the instant, when the radius of the circular wave is 10 cm, how fast is the enclosed area increasing?
6. Find the interval where the function decreases.
7. Find the interval in which the function decreases.
8. Find the values of for which the function is decreasing.
9. Show that is an increasing function of , throughout its domain.
10. Find the intervals in which the function is given by is

(i)Increasing(ii) decreasing

1. Find the intervals in which the function is increasing.
2. Find the intervals in which the function is decreasing.
3. Prove that is an increasing function in .
4. Prove that the function defined by is neither increasing nor decreasing in . Hence find the intervals in which is strictly increasing.
5. Which of the following functions is decreasing on ?

a) b) c) d)

1. Find the slope of the tangent to the curve at the point whose x-coordinate is 2.
2. Find the points on the curve at which the tangent lines are parallel to the line .
3. Find the slope of the tangent to at .
4. What is the slope of the normal to the curve at the point
5. Find the point at which the line is a tangent to the curve .
6. Find the equation of tangents to the curve which are perpendicular to the line .
7. The equation of the tangent at on the curve is . Find the values of and .
8. Find the equations of the tangent and normal to the curves and at .
9. Find the points on the curve at which tangent is parallel to .
10. Find the equations of the tangent to the curve which is Perpendicular to the line .
11. Using differentials, find the approximate value of up to two places of decimals.
12. Using differentials, find the approximate value .
13. Find the approximate value of up to 2 places of decimal, where .
14. Using differentials, find the approximate value of
15. Using differentials, evaluate
16. If has extreme values at and . Find and .
17. Find the local maxima and local minima of the function . Also, find the local maximum and local minimum values.
18. If , then which is the possible extreme point of in ?
19. For what value of x, is the function the maximum?
20. Give an example of a function that does not possess a relative maximum or relative minimum. A
21. What is the least value of in ?
22. Find the critical points off .
23. Find the point of local maximum for
24. State where attains a maximum value in the interval
25. The sum of the perimeters of a circle and square is , where is some constant. Prove that the sum of their areas is least when the side of the square is double the radius of the circle.
26. Show that the height of the right circular cylinder of greatest volume which can be inscribed in a right circular cone of height and radius is one-third of the height of the cone and the greatest volume of the cylinder is times the volume of the cone.
27. Show that the surface area of a closed cuboid with a square base and given volume is minimum when it is a cube.
28. A window is in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window is 10 m. Find the dimensions of the window to admit maximum light through the whole opening.
29. A metal box with a square base and vertical sides is to contain 1024 . The material for the top and bottom costs ₹ 5 per and the material for the sides costs ₹ 2.50 per . Find the least cost of the box.
30. Show that the semi-vertical angle of the cone of the maximum volume and given slant height is
31. Prove that the least perimeter of an isosceles triangle in which a circle of radius can be inscribed is .
32. Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius is . Also, find the maximum volume in terms of the volume of the sphere.
33. Prove that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius is . Also, find the maximum volume.
34. Prove that the semi-vertical angle of the right circular cone of a given volume and least curved surface area is
35. Of all the closed right circular cylindrical cans of volume, find the dimensions of the can which has a minimum surface area.
36. Find the equations of tangents to the curve , which passes through the point .
37. Find the area of the greatest rectangle that can be inscribed in an ellipse .
38. Prove that all normal to the curves and are at a constant distance from the origin.
39. Show that the right circular cone of the least curved surface and given volume has an altitude equal to times the radius of the base.
40. Show that of all rectangles of the given area, the square has the smallest perimeter.
41. Find the open interval in which the function is increasing.
42. If decreases for all real values of x show that .
43. Fill in the blank: The line is a tangent to the curve if the value of is \_\_\_\_\_\_\_ .
44. Prove that is an increasing function in .
45. Find the value of for which the curves and cut each other at right angles.