CHAPTER 6
APPLICATION OF DERIVATIVES
ASSERTION – REASON QUESTION

In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R), Mark the correct choice as

A) Both A and R are true and R is the correct explanation of A

B) Both A and R are true but R is not the correct explanation of A

C) A is true but R is false

D) A is false and R is true

1	Let $a, b \in R$ such that the function f given by $f(x) = \ln|x| + x^2 + ax$, $x \neq 0$ has extreme values at $x = -1$ and $x = -2$. Assertion : f has a local maximum at x = -1 and at x = 2 Reason: $a = \frac{1}{2}$ and $b = -\frac{1}{4}$
2	Assertion : The minimum value of $f(x) = x^2 - 8x + 17$ is 1 Reason : If $f'(c) = 0$ and $f''(c) > 0$ then f has a local minimum.
3	A function$f$ $is\ given\ by\ f(x) = 2x^3 - 6x^2 + 6x + 5$ Assertion : x = 1 is not a point of local maxima Reason : x = 1 is not a point of local minima
4	Assertion : If two positive numbers are such that sum is 16 and sum of their cubes is minimum, then the numbers are 8 and 8. Reason : Let f be twice differentiable at x = c such that $f'(c) = 0$ and $f''(c) > 0$ then f has a local minima and f (c) is the local minimum value of f.
5	Assertion (A) : The function f(x) = $x^3 - 3x^2 + 6x - 100$ is strictly increasing on R Reason (R) : A strictly increasing functions is an injective function
6	Assertion (A) : The function f(x) = log x is defined for all x ∈ (0, ∞) Reason (R) : If $f'(x) > 0$ then f(x) is strictly decreasing function.
7	Assertion (A) : f(x) = a(x + sin x) is an increasing function if a ∈(0, ∞) Reason (R) : The given function f(x) is increasing only if a ∈ (0, ∞)
8	Assertion (A) : :The curve y = x^2 represents a parabola with vertex at origin. Reason (R) : :For a curve Tangent and Normal lines are always perpendicular at thepoint of contact.
9	Assertion (A) : For the curve y = tanx , the tangent and normal exists at a point (0, 0). Reason (R) : Tangent and Normal lines are x – y = 0 and x + y = 0.

10	Assertion (A: The function $f(x) = x^3 - 3x^2 + 6x - 100$ is increasing in R Reason (R) 2: A function will be increasing in an interval if $f^{/}(x) \geq 0$
11	Assertion (A: The function $f(x) = \log(sinx)$ is strictly increasing $(0, \frac{\pi}{2})$ Reason (R): $sinx$is positive in first quadrant
12	Assertion (A: The function $f(x) = x^2 - x + 1$ is increasing strictly in the interval (0,1) Reason (R): The function has turning point at $x = \frac{1}{2}$
13	Assertion (A: The curve $16x^2 - 9y^2 = 144$ has two tangents parallel to x-axis. Reason (R): At the points where tangents drawn to a curve are parallel to x-axis,$\frac{dy}{dx} = 0$
14	Assertion (A): $f = e^x$ do not have maxima or minima in R. Reason(R): Monotonic functions have maxima or minima at endpoints of Domain.
15	Assertion (A): Minimum value of $f = 9x^2 + 12x + 2$ is -2. Reason(R): Maximum value of $f = 9x^2 + 12x + 2$ does not exist.
16	Assertion (A): The function $f = \|x - 3\|$does not have any critical point. Reason(R): Critical points of a function are where $f^{'} = 0 \; or \; f \; is$ not differentiable.
17	An open-top box is to be constructed by removing equal squares from each corner of a 3m by 8m rectangular sheet and folding up the sides. Assertion (A): Maximum volume of the box is 200/27 cubic meters. Reason(R): Volume is largest when the square of side 2/3 is removed from each corner
18	Assertion (A): The absolute maximum value of the function $f = (x - 1)^2 + 3 \; in \; [-3, 1]$ is 19 Reason(R): The absolute value of function exists only on critical point of a function in I.
19	Assertion (A): The equation of tangent to the curve y=sin x at point (0,0) is y = x. Reason (R): if y= sin x then $\frac{dy}{dx}$ at x= 0 is 1..
20	Assertion (A): The Normal to the curve $2y + x^2 = 3$ is at point (1, 1) is x- y = 0 . Reason (R) :Slope of the Normal at (1,1) is 1 .
21	Lets consider the function f(x) = $\frac{4x^2+1}{x}$ Assertion (A) : f(x) is increasing on $(-\infty, -\frac{1}{2}) \cup (\frac{1}{2}, \infty)$ Reason (R) Critical points are - ½ , ½ .
22	The slope of the curve $2y^2 = ax^2 + b$ at (1, -1) is -1 then Assertion (A) : Value of 'a' is 2. Reason (R) : Value of 'b' is 0 .
23	Assertion(A):The function $f(x)=x^3-3x^2+6x-100$ is strictly increasing on R Reason(R) :A strictly increasing function is an injectivefunction
24	Assertion(A):The function $y =[x(x-2)]^2$is increasing in(0,1)∪(2,∞) Reason(R):dy/dx=0, when x=0,1,2.
25	Assertion (A):If $f(x)$=a(x+sinx) is increasing function if a∈(0,⍰) Reason(R) :Thegiven function f(x)is increasing only if a∈(0,⍰)
26	Assertion (A):For the curve y = tanx,the tangent and normal exists at a point(0,0). Reason(R) :tangent and normal linesare x–y = 0 and x+y=0.
27	Assertion (A):The curvey =x^2 represents a parabola with vertex at origin. Reason(R) :for a curve tangent and normal lines are always perpendicular at the point of contact.

28	Assertion (A):$f(x)=sin2x+3$ is defined for all real values of x. Reason(R) :Minimum value of f(x) is 2and Maximum value is 4.
29	Assertion (A):$f(x)$=sin($sinx$)is defined for all real values of x. Reason(R) :Minimum and minimum values does not exist.
30	Assertion(A):f()=−|x+1|+3isdefinedforallrealvaluesofxexceptx=-1. Reason(R) :Maximumvalue of f(x) is3and Minimumvalue doesnotexist.
31	AB is the diameter of a circle and C is any point on the circle. Assertion(A):The area of triangle ABC is maximum when it is isosceles. Reason(R) : Triangle ABC is a right–angled triangle.
32	Assertion(A):Awindow has the shape of a rectangle surmounted by an equilateral ltriangle. If the perimeter of the window is 12m,then length1.782m and breadth 2.812m of the rectangle will produce the largest area of the window. Reason(R) : For maximum or minimum $f'(x)$=0.
33	The sum of the surface area (s) of a sphere of radius r and cuboid with sides $\frac{x}{3}$, x and 2x is a constant. Assertion: the sum of their volumes (V) is minimum when x equals three times the radius of the sphere. Reason: V is minimum when $r=\sqrt{\frac{5}{54+4\pi}}$.
34	Assertion: The function $y=\log(1+x)-\frac{2x}{2+x}$ is a decreasing function of x throughout its domain. Reason: The domain of the function $f(x)=\log(1+x)-\frac{2x}{2+x}$ where maximum and minimum lies is $(-1,\infty)$.
35	AB is a diameter of the circle and c is any point on the circle. Assertion: the area of ΔABC is minimum when it is isosceles. Reason: ΔABC is a right angled triangle.
36	A cylinder is inscribed in a sphere of radius R. Assertion: Height of the cylinder of the maximum volume is $\frac{2R}{\sqrt{3}}$ units. Reason: The maximum volume of the cylinder is $\frac{4\pi R^3}{\sqrt{3}}$units.
37	Assertion: The altitude of the cone of maximum volume that be inscribed in a sphere of radius r is $\frac{4r}{3}$.\ Reason: The maximum volume of the cone is $\frac{8}{27}$ of the volume of the sphere.
38	Assertion : Both sinx and cosx are decreasing and functions in the interval $\left(\frac{\pi}{2},\pi\right)$.

	Reason : If a differentiable function decreases in an interval (a, b), then its derivative also decreases in (a , b).
39	Assertion : The function $f(x) = \log cosx$ is increasing function for $\left[0\,, \frac{\pi}{2}\right]$. Reason : function is strictly increasing when slope of tangent is positive and function is strictly decreasing when the slope of tangent is negative.
40	Assertion :If $f(x) = \log sinx$, $x > 0$ is strictly decreasing in $\left(\frac{\pi}{2}\,, \pi\right)$. Reason : if $f'(x) \geq 0$, then f(x) is strictly increasing function. Which of the following is true :
41	Assertion : x+y-3 = 0 is the equation of the normal to the curve $x^2 = 4y$ which passes through the point (1, 2). Reason : if slope of the tangent line is zero then $\tan\theta = 0$ $and\ so\ \theta = 0$, which means the tangent line is parallel to x- axis.
42	Assertion : Two curves $ax^2 + by^2 = 1\ and\ a'x^2 + b'y^2 = 1$ are orthogonal if $\frac{1}{a} - \frac{1}{b} = \frac{1}{a'} - \frac{1}{b'}$. Reason : Two curves intersect orthogonally at a point if product of their slope at that point is -1.
43	Assertion (A) Curve $y = xe^x$ is minimum at the point $x = -1$. Reason (R) $\frac{dy}{dx} < 0\ at\ x = -1$.
44	Assertion (A) The largest area $A(x)$ rectangular field which can be enclosed with 200m fencing is 2500m^2. Reason (R) $A''(x) < 0\ at\ x = 50$
45	Assertion (A) The maximum value of $f(x) = \frac{x}{4+x+x^2}\ on\ [-1,1]$ is$\frac{1}{6}$. Reason (R) $f'(x) = 0\ and\ f''(x) < 0\ at\ x = 1$.
46	Assertion (A) Absolute maximum and minimum value of function $f(x) = 12x^{4/3} - 6x^{1/3}, x \in [-1,1]$ are 18 and 0 at points $x = -1\ and\ x = 0$ respectively. Reason (R) For $f(x), f\left(\frac{1}{8}\right) < f(0) < f(1) < f(-1)$.
47	Assertion (A) The radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of the radius of the cone. Reason (R) If $x, r\ and\ S$ are radius of cylinder, radius of cone and curved surface area of cylinder then$S'(x) = 0\ at\ x = \frac{r}{2}$.

48	Assertion (A): - Let f:-R-R be a function such that f(x) =$x^3+x^2+3x+\sin x$, then f is one one. Reason (R): f(x) neither increasing nor decreasing function.
49	Assertion (A):- the curve $x=y^2$ and xy=k cut at right angle if $8k^2=1$ Reason(R):-Two curves intersect at right angles if the tangents to the curve at the point of intersection are perpendicular to each other i.e. product of their slope is -1.
50	Assertion (A): The tangent to the curve $y=x^3-x^2-x+2$ at (1, 1) is parallel to the x - axis Reason (R): The slope of the tangent to the curve at (1, 1) is zero
51	Assertion (A): The function $f(x) = \frac{logx}{x}$ is increasing in the interval (0, e) Reason (R):A function is increasing if f'(x)>0
52	Assertion (A): The local maximum and minimum values of the function $f(x) = x^3 - 6x^2 + 9x + 15, x \in R$, are 19 and 15 respectively. Reason (R): $Point\ \ x = 1\ is\ a\ point\ of\ local\ maxima\ and$ $x = 3\ is\ a\ point\ of\ local\ minima.$

ANSWERs:

1	A	11	B	21	A	31	A	41	B	51	A
2	A	12	D	22	A	32	A	42	A	52	A
3	B	13	D	23	(B)	33	A	43	C		
4	A	14	A	24	(B)	34	D	44	A		
5	B	15	B	25	(D)	35	A	45	C		
6	C	16	D	26	(A)	36	C	46	D		
7	D	17	A	27	(B)	37	B	47	B		
8	B	18	C	28	A	38	C	48	C		
9	A	19	A	29	C	39	D	49	A		
10	A	20	A	30	D	40	D	50	A		

Prepared by : PGT(Maths) of BHUBANESWAR REGION, GUWAHATI REGION, KOLKATA REGION, SILCHAR REGION, RANCHI REGION & TINSUKIA REGION

Vetted by : KOLKATA REGION