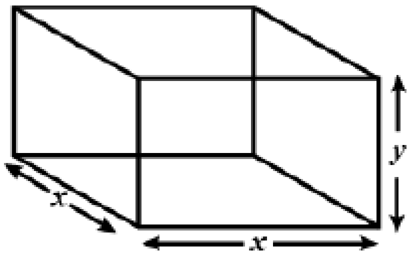
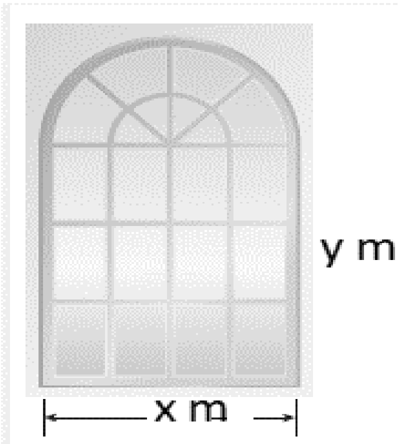
CHAPTER-6
APPLICATION OF DERIVATIVES
01 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	The interval in which the function f given by f(x) = x^2e^{-x} is strictly increasing (a) $(-\infty, \infty)$ (b) $(-\infty, 0)$ (c) $(2, \infty)$ (d) $(2, 0)$	1
2.	The maximum value of $(\frac{1}{x})^x$ (a) e (b) e^e (c) $e^{\frac{1}{e}}$ (d) $(\frac{1}{e})^{\frac{1}{e}}$	1
3.	The maximum value of $[x(x-1)+1]^{1/3}, 0 \le x \le 1$ is (a) $(\frac{1}{3})^{1/3}$ (b) $\frac{1}{2}$ (c) 1 (d) 0	1
4.	The maximum volume of slope of the curve y= $-x^3+3x^2+12x-5$ is (a) 0 (b) 9 (c) 12 (d) 15	1
5.	The total revenue in rupees received from the sale of x units of a product is given by R(x) = $3x^2 + 36x + 5$.The marginal revenue,when x = 15 is (a) 126 (b) 96 (c) 90 (d) 116	1
6.	The rate of change of the area of a circle with respect to its radius r at r = 6 cm is (a) 10π (b) 12π (c) 8π (d) 11π	1
7.	The rate of change in area of square w.r.t side when side is $\frac{1}{\sqrt{3}}$ unit is (a) $\frac{2}{\sqrt{3}}$ unit²/sec (b) $\frac{1}{\sqrt{53}}$ unit²/sec (c) 2 unit²/sec (d) none of these	1
8.	For which value of 'a' is the function f(x) = ax^2+2 decreasing in [1.2] ? (a) $(1, 2)$ (b) $(-\infty, 0)$ (c) [1, 2] (d) none of these	1
9.	If the function f(x) = $2x^2 - kx + 5$ is increasing on [1,2] ,then k lies in the interval (a) $(-\infty, 4)$ (b) $(4, \infty)$ (c) $(-\infty, 8)$ (d) $(8, \infty)$	1
10.	If x is real,the minimum value of $x^2-8x+17$ is (a) -1 (b) 0 (c) 1 (d) 2	1
11.	The rate of change of the area of a wheel of a cycle with respect to the distance between the outer surface and the hub of the wheel, which is 6 cm is (a)36π (c)12 π (b)24 π (d)17 π 	1

12.	Find the maximum value of the function $f(x) = 3x^2 - 12x + 5$ within the interval $[-1,4]$.	1
13.	There is a bottle company say C whose total revenue in rupees received from the sale of x units of bottle is given by $R(x) = 5x^3+3x+2$. When 12 units of the bottle will be sold then find the marginal revenue. 	1
14.	The value of x for which $(x - x^2)$ is maximum is (a)3/4 (c)1/3 (b)1/2 (d)1/4	1
15.	If x is real, then the minimum value of $x^2 - 8x + 17$ is (a)-1 (c)0 (b)1 (d)2	1
16.	The value of b for which the function $f(x) = x + cos\ cos\ x + b$ is strictly decreasing over R is (a)b≥1 (c)for no values of b (b)b≤1 (d)b=1	1
17.	The interval on which the function $f(x) = x^2 - 4x + 6$ is strictly increasing is (a) $(-\infty, 2) \cup (2, \infty)$ (b) $(2, \infty)$ (c) $(-\infty, 2)$ (d) $(-\infty, 2] \cup (2, \infty)$	1
18.	The area of a trapezium is defined by a function which is given by $f(x) = (10 + x)\sqrt{100 - x^2}$ then the area when it is maximized is (a)75 cm^2 (c)7 $\sqrt{3}$ cm^2 (b)75$\sqrt{3}$ cm^2 (d)5 cm^2	1
19.	A particle is moving along the x-axis with a velocity given by $v(t) = 3t^2 - 4t + 1$. Find the acceleration of the particle when $t = 2$.	1
20.	The cost *C* of producing *x* units of a product is given by $C(x)$=1000+5x+0.02x^2. Find the production level that minimizes the cost.	1
21.	Sahaj wants to prepare a handmade gift for his father's birthday at Home. For making lower part of box, he takes a square piece of Cardboard of side 20cm.If x cm be the length of each side of the Square cardboard which is to be cut from corners from square piece of side 20 cm then What is the volume function of open box formed by folding up the cutting corners?	1
22.	A particle is moving along the curve represented by the polynomial f(x) =$(x - 2)^2(x - 1)$. Based on above information answer the following questions: Find the rate at which the particle is moving.	1

23.	1. Read the following passage and answer the questions given below Anuja wants to make a project for State level Science Exhibition. For this she wants to make metal box with square base and vertical sides to contain of 1024 cm^3 water material for top and bottom costs ₹ 5 per cm^2 and material for slides costs ₹2.5 per cm^2.  What is the cost of the box in terms of x?	1
24.	Dr. Rohan residing in Delhi went to see an apartment of 3BHK in Noida. The window of the house in the form of a rectangle surrounded by a semicircular opening having a perimeter of the window 10 m as shown in the figure  (i) If x and y represents the length and breadth of the rectangular region, then what is the relation between the variables.	1
25.	Read the following passage and the answer the questions given below. f (x)= -- $0.1x^2 + mx + 98.6$, $0 \le x \le 12$, m being a constant, where f (x) is the temperature in ^{0} F at x days. Find the intervals in which the function is strictly increasing / strictly decreasing	1
26.	A company makes closed water storage tank. The water tank is cylindrical in shape. Let S be the given surface area ,r be the radius of base and h be height of the tank . Based on the information provided answer the following : Relation between S,r and h is: (a) $S = 2\pi rh + 2\pi r^2$	1

	(b) $S = 2\pi rh + \pi r^2$ (c) $S = \pi r^2 h + \pi r^2$ (d) $S = \pi r^2 h + 2\pi r^2$	
27.	Questions consists of two statements−Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below – a) Both A and R are true and R is the correct explanation for A b) Both A and R are true and R is not the correct explanation for A c) A is true but R is false d) A is false but R is true Assertion (A : The function $f(x) = x^3 + 3x^2 + 3x + 7$ is increasing for all real values of x Reason (R) : For any function $y = f(x)$ to be increasing, $\frac{dy}{dx} > 0$	1
28.	Function $f(x) = 2x^3 - 6x + 5$, is an increasing function in the interval (A) $\left(-\infty, -\frac{1}{2}\right) \cup (\frac{1}{2}, \infty)$ (B) $(-1,1)$ (C) $\left(-1, -\frac{1}{2}\right)$ (D) $(-\infty, -1) \cup (1, \infty)$	1
29.	The area of a trapezium is defined by function f and given by $f(x) = (10 + x)\sqrt{100 - x^2}$, then the area when it is maximised is: (A) 75 sq. unit (B) $7\sqrt{3}$ sq. unit (C) $75\sqrt{3}$ sq. unit (D) 5 sq. unit	1
30.	The maximum value of $[x(x - 1) + 1]^{\frac{1}{3}}, 0 \leq x \leq 1$ is: (A) 0 (B) $\frac{1}{2}$ (C) 1 (D) $\sqrt[3]{\frac{1}{3}}$	1

ANSWERS:

Q. NO	ANSWER	MARKS
1.	(d) $(2, 0)$	1
2.	(c) $e^{\frac{1}{e}}$	1
3.	(c) 1	1
4.	(d) 15	1
5.	(a) 126	1
6.	(b) 12π	1
7.	(a) $\frac{2}{\sqrt{3}}$ unit^2/sec	1
8.	(b) $(-\infty, 0)$	1
9.	(a) $(-\infty, 4)$	1
10.	(c) 1	1
11.	c	1
12.	To find the maximum value of a function within a given interval, we need to follow these steps: Calculate the derivative of $f(x)$: $f'(x)=6x-12$ Set $f'(x)=0$ and solve for x: $6x-12=0$ $x=2$ **Now** Determine the endpoints of the interval. The interval is $[-1, 4]$, so the endpoints are $x=-1$ and $x=4$. **Step 3:** Evaluate the function $f(x)$ at the critical points and endpoints. Evaluate $f(x)$ at the critical point $x=2$: $f(2)=3(2)^2-12(2)+5=12-24+5=-7$. Evaluate $f(x)$ at the endpoints $x=-1$ and $x=4$: $f(-1)=3(-1)^2-12(-1)+5=3+12+5=20$ $f(4)=3(4)^2-12(4)+5=48-48+5=5$. Compare the values obtained in Step 3 to determine the maximum value. The maximum value of the function within the interval $[-1, 4]$ is 2020, which occurs at $x=-1$. Therefore, the maximum value of $f(x)=3x^2-12x+5$ within the interval $[-1,4]$ is 20.	1
13.	Marginal revenue is rate of change of total revenue. As total revenue is given as $R(x) = 5x^3 + 3x + 2$ So marginal revenue is $\frac{dR}{dx} = 15x^2 + 3$ At $x = 12$ $\frac{dR}{dx}\|_{x=12} = 15(12)^2 + 3 = 2163$	1
14.	b	1
15.	b	1
16.	c	1
17.	b	1
18.	b	1
19.	Given $v(t) = 3t^2-4t+1$, we want to find $a(t)$ when $t=2$. Acceleration is the derivative of velocity with respect to time: $a(t)=dv/dt$. Differentiate $v(t)$ with respect to t: $a(t)=d/dt(3t2-4t+1)$.	1

	$a(t)=6t-4$. Evaluate $a(t)$ at $t=2$: $a(2)=6(2)-4$. $a(2)=12-4=8$ m/s². So, the acceleration of the particle when $t=2$ is 88 m/s².	
20.	Given $C=1000+5x+0.02x^2$, we want to find the value of x that minimizes C. Differentiate C with respect to x: $dC/dx=5+0.04x$. Set $dC/dx=0$ and solve for x. So, $5+0.04x=0$ Or $0.04x=-5$ Or $x=-5/0.045=-125$. Since the number of units produced cannot be negative, we reject the negative value. So, the production level that minimizes the cost is $x=0$ units.	1
21.	$V=x(20-2x)(20-2x)$	1
22.	$f'(x)=(x-2)(3x-4)$.	1
23.	Let C denotes the cost of the box $C=2x^2\times 5+4xy\times 2.5$ $\Rightarrow C=10x^2+\frac{10240}{x}$	1
24.	$X+2y+\pi\frac{x}{2}=10$	1
25.	f (x)= -- 0.1x ^{2} + m x + 98.6 $f'(x)) = -0.2x+1.2=-0.2(x-6)$ In the Interval [0, 6) $f'(x)$)+ve then f is strictly increasing in [0, 6) In the Interval (6, 12] $f'(x)$ is -ve f is strictly decreasing in (6, 12]	1
26.	a	1
27.	a	1
28.	d	1
29.	c	1
30.	c	1