THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"
AIM HIGH, TOGETHER WE FLY

GRADE: XII Date: 05/11/2024	**MT 3 (2024-25)** **APPLIED MATHEMATICS**	**Marks: 20** **Time: 1 hours**

Name:

Class & Section:

Q.No	Questions	Mark
	SECTION A	
1	Find $\frac{dy}{dx}, \; if \;\; x^2 - y^2 - 5 = 0$ a) $\frac{x}{y}$ c) 2y b) 2x d) 0	**1**
2	Find $\frac{dy}{dx} x^2$ a) x c) 0 b) 2x d) 2	**1**
3	Find the second order derivative of $ax^3 + bx^2 + cx + d$ a) 3ax+2bx+c c) 3a$x^2 + 2bx + c$ b) 6ax+2b d) 3a+b	**1**
4	Find the derivative of $x^2.e^x$ c) $x^2.e^x + e^x.2x$ c) $x.e^x + x^2.2x$ d) $x^2.xe^x + e^x.2x$ d) none of the above	**1**
5	A function is said to be strictly increasing on an open interval (a,b) if a) $x_1 < x_2 \Rightarrow f(x_1) > f(x_2)$ b) $x_1 < x_2 \Rightarrow f(x_1) < f(x_2)$ c) $x_1 < x_2 \Rightarrow f(x_1) \leq f(x_2)$ d) $x_1 < x_2 \Rightarrow f(x_1) \geq f(x_2)$	**1**

	SECTION B	
6	Find the interval in which the function is strictly increasing or decreasing $$f(x) = 5 + 36x + 3x^2 - 2x^3$$ F'(X)=36+6x-6x^2=-6(x-3)(x+2) The function f(x) will be strictly increasing if f'(x)>0 -6(x-3)(x+2)>0 x>3 and x<-2 f(x) is strictly increasing for -2<x<3 The function f(x) will be strictly increasing if f'(x)<0 -6(x-3)(x+2) < 2 x > 3, x <-2 f(x) is strictly decreasing for x < -2 or x >3	**2**
7	Divide 30 into two parts such that their product is maximum P= x(30-x) dp/dx = 30-2x dp/dx =0 30-2x=0 X=15 $\frac{d^2p}{dx^2} = -2$ P is maximum when First part = 15 Second part= 15	**2**
8	If the cost function is $C = 40 - 6x + x^2$, find the minimum value of cost C? dC/dx = -6+2x minimum: dC/dx =0 -6+2x=0 X=3 $\frac{d^2C}{dx^2} = 2 > 0$ C is minimum when x=3 Then C= 31	**2**
	SECTION C	
9	Find the local maximum and local minimum values, if any of the function	**3**

	$y = \frac{x^4}{x-1}, \ x \neq 0$ dy/dx = $x^3(3x-4)/(x-1)^2$ max or min , dy/dx= 0 =x= 0, 4/3 At x=3 X strictly <0 dy/dx= +ve X strictly >0 dy/dx = -ve F(x) has a local maximum at x=0 Local max value at x=0 F(0)=0 At x= 4/3 X strictly <4/3 dy/dx= -ve X strictly >4/3 dy/dx = +ve F(x) has a local maximum at x=0 Local min value at x=4/3 Loc min value = 256/27	
10	The total revenue received from the sale of x units of a product is given by $R(x) = 200 + \frac{x^2}{5}$ Find i) The average revenue= 200/x + x/5 ii) The marginal revenue= 2x/5 iii) The marginal revenue when x=25 10	**3**
11	**Case study** An architecture design an auditorium for a school for its cultural activities. The floor of the auditorium is rectangular in shape and has a fixed perimeter P.  Based on the above information solve the following questions: i) If x and y represents the length and breadth of the rectangular region, then relation between the variable is: a) $x + y = P$ b) $x^2 + y^2 = P^2$	**1**

	c) $2(x+y)=P$ d) $x+2y=P$ ii) The area A of the rectangular region, as a function of x, can be expressed as: a) $A=Px+\frac{x}{2}$ b) $A=\frac{Px+x^2}{2}$ c) $A=\frac{Px-2x^2}{2}$ d) $A=\frac{x^2}{2}+Px^2$ iii) School manager is interested in maximising the area of the floor A for this to be happen, the value of x should be: a) P b) $\frac{P}{2}$ c) $\frac{P}{3}$ d) $\frac{P}{4}$	**1** **1**

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