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CLASS 12 SUBJECT Mathematics CHAPTER- 1 Relation and Function MM-30

Q1.	On the set A = {1,2,3}, check whether the relation R = {(1,1), (2,3)] (3,1)} is reflexive, symmetric and transitive.	1
Q2.	Find gof and fog when f : R ➔ R and g : R ➔ R are defined by f(x) = 2x +3, g(x) = x^2+5.	1
Q3.	Let f = {(3,1)] (9,3), (12,4)} and g = {(1,3)] (3,3), (4,9), (5,9)} find fog and gof.	1
Q4.	Let * be a binary operation on the set I of integers, defined by a * b = 2a +b-3 . Find 3 * 4.	1
Q5.	Examine whether the binary operation * on R defined by a * b = ab +1 is associative or not.	2
Q6.	If f(x) = $\frac{4x+3}{6x-4}$, x $\neq \frac{2}{3}$, show that fof (x) = x .	2
Q7.	If R = {x,y) : x + 2y = 8} is a relation on N, then write the range of R.	2
Q8.	Show that the relation R on the set A = {1,2,3,4,5}, given by R = {(a,b) : Ia bI is even} in an equivalence relation. Show that all the elements of {1,3,5} are related to each other and all the elements of {2,4} are related to each other but no element of {1,3,5} are related to any element of {2,4}.	4
Q9.	Show that f : N➔ N defined by F(n) $= \begin{cases} \frac{n+1}{2}, & \text{if n is odd} \\ \frac{n}{2}, & \text{if n is even} \end{cases}$ is many one onto function.	4
Q10.	Prove that the intersection of two equivalence relations on a set is an equivalence relation.	6
Q11.	Let X be a non empty set and let * be a binary operation on P(x) (the power set of X) defind by A * B = AUB V A,B,∈ P(X). Prove that * is both commutative and asociative on P(x) find the identity element w.rt. * on p(x). Also show that Ø ∈ p (x) is the only invertible element of PIX)	6

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CLASS 12 SUBJECT Mathematics CHAPTER- 2Inverse Trigonometric Functions MM-30

Q1.	Evaluate $\tan^{-1}$ {2cos (2,$\sin^{-1}$1/2)}	1
Q2.	Find the principal value of sin $\frac{1}{2}$ -2sin^{-} $\frac{1}{\sqrt{2}}$	1
Q3.	Evaluate $\tan^{-1}\sqrt{3}$ - sec (-2) + cosec^{-1} $\frac{2}{\sqrt{3}}$	1
Q4.	Evaluate : $\tan^{-1}$ (tan $\frac{3\pi}{4}$)	1
Q5.	Simplify : $\tan^{-1}\left(\frac{cosx - sinx}{\cos x+\sin x}\right)$, $-\frac{\pi}{4} < x < \frac{\pi}{4}$	2
Q6.	Simplify : $\tan^{-1}\sqrt{\frac{a-x}{a+x}}$, a < x< a	2
Q7.	Prove that $\tan^{-1}\left\{\frac{\sqrt{1+\cos x} - \sqrt{1-cosx}}{\sqrt{1+\cos x} + \sqrt{1-\cos x}}\right\} = \frac{\pi}{4} - \frac{x}{2}$	2
Q8.	Prove that cos [$\tan^{-1}$ } sin ($\cos^{-1}$)] $\sqrt{\frac{x^2+1}{x^2+2}}$	4
Q9.	Prove that $\tan^{-1}\frac{1}{5}$ + $\tan^{-1}$ + tan $\frac{1}{7}$ + $\tan^{-1}\frac{1}{8} = \frac{\pi}{4}$	4
Q10.	Prove that i) Cos $\left(\frac{ab+1}{a-b}\right)$ + $\cos^{-1}\left(\frac{bc+1}{b-c}\right)$ + $\cos^{-1}\left(\frac{ca+1}{c-a}\right) = \pi$ ii) If $\cos^{-1}\frac{y}{a} + \cos^{-1}\frac{y}{b} = \alpha$, prove that $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos\alpha + \frac{y^2}{b^2} = sin^2\ \alpha$	6
Q11.	i) Solve $\tan^{-1}\left(\frac{x-1}{x-2}\right)$ + tan$\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$ ii) Solve 2 $\tan^{-1}$ (cos x) = $\tan^{-1}$ (2 cos x)	6

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CLASS 12 SUBJECT Mathematics CHAPTER- 3 Matrices MM-30

1. Find the inverse of $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ by using elementary row transformations. **6**

2. Find x if $[1 \quad x \quad 1] \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$ **4**

3. In a election, a firm promoted his candidate in 3 ways; telephone, house visits and letters. The cost per contact is given in Matrix A & the no. of contacts of each type made in two cities x & y is given in matrix B. Find the total amount spent by firm. **4**

$$A = \begin{array}{c} \begin{bmatrix} 40 \\ 100 \\ 50 \end{bmatrix} \end{array} \begin{array}{l} \text{Telephone} \\ \text{House visit} \\ \text{Letter} \end{array} \qquad B = \begin{array}{c} \begin{array}{ccc} \text{Telephone} & \text{House visit} & \text{Letter} \end{array} \\ \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 1000 \end{bmatrix} \end{array} \begin{array}{l} x \\ y \end{array}$$

4. Express the given matrix as a sum of a symmetric and a kew, symmetric matrix. If **4**

$$A = \begin{pmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{pmatrix}$$

5. If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ show that $A^2 - 5A + 7I = 0$. Hence, find A^{-1}. **4**

6. A trust caring for handicapped children gets Rs 30,000 from its donors. The trust spends half of the funds received for medical and educational care of the children and for that it charges 2% of spent amount from them and deposits the balance amount in a private bank to get the money multiplied so that in future the trust functions regularly. What percent of interest the trust should get from the bank so that it receives an interest of Rs. 1800? Using matrix method finds the rate of interest. Do you think the people should donate to such trusts?

4

7. If the matrix A = [a b c], evaluate AA' where A,' is the transpose of A. **2**

8. Construct a 2x2 matrix A=[a_{ij}] whose elements are given by $a_{ij} = (\mathbf{i} - \mathbf{j})^3$ **2**

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CLASS 12 **SUBJECT Mathematics** **CHAPTER- 4 Determinants** **MM-30**

1. Using properties of determinants, prove that **4**

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+C)^3$$

2. Proving that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+C \end{vmatrix} = bc+ca+ab+abc$ **4**

3. A school wants to award its students for Honesty, Regularity & Hard work with a total cash award of Rs. 6000. Three times the award money for hard work added to that given for honesty amounts to Rs.11000. The award money for honesty and hard work together is double the one given for regularity. Find the award money for each value, using matrix method suggest one more value which the school must include for awards. **4**

4. Evaluate the determinant: $\begin{vmatrix} 1+i & 1-i \\ 1-i & 1+i \end{vmatrix}$ **2**

5. Using properties of determinants prove $\begin{vmatrix} a^2 & cb & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} = 4a^2b^2c^2$ **4**

6. If area of triangle is 35 unit^2 with vertices (2, -6) (5, 4) and (K, 4) then find K. **4**

7. Solve the following system of equations by matrix method **4**

$$3x - 2y + 3z = 8$$
$$2x + y - z = 1$$
$$4x - 3y + 2z = 4$$

8. If x, y, z are different and $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ **4**

Then show that $1+xyz = 0$

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CLASS 12 SUBJECT Mathematics CHAPTER- 5 Differentiation MM-30

Q1.	If f(x) = $\log_e(\log_e x)$, find $f^1(e)$	1
Q2.	If f(x) =x +1, find $\frac{d}{dx}$ (fof) (x)	1
Q3.	If $f^1(1)$ = 2 and y = f ($\log_e x$) , find $\frac{dy}{dx}$ at x = e	1
Q4.	If y = x IxI, find $\frac{dy}{dx}$ for x < 0.	1
Q5.	if y = x^x, find $\frac{dy}{dx}$ at x = e	2
Q6.	If y = tan-1$\sqrt{\frac{1-cos2x}{1+cos2x}}$, find dy/dx.	2
Q7.	If x = a $(\theta + sin\theta)$, y = a (1 - cos θ) find dy/dx	2
Q8.	If y = $\sin^{-1}x$, prove that : $(1-x^2)\frac{d^2y}{dx^2} - x.\frac{dy}{dx} = 0$.	4
Q9.	If y = $(x \cos x)^x + (x \sin x)^{1/x}$, find $\frac{dy}{dx}$	4
Q10.	If $\sqrt{1-x^6} + \sqrt{1-y^6} = a(x^3 - y^3)$, Prove that dy/dx = $\frac{x^2}{y^2}\sqrt{\frac{1-y^6}{1-x^6}}$	6
Q11.	If y = $\{\log(x + \sqrt{x^2+1}\}^2$, show that $(1+x^2)\, y_2 + xy_1 = 2$.	6

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CLASS 12 SUBJECT Mathematics CHAPTER- 6 Applications of Derivatives MM-30

Q1.	An edge of a cube is increasing at the rate of 10 cm/sec. How fast is the volume of the cube increasing when the edge is 5 cm long?	1
Q2.	Use differentiates to approximate $\sqrt{25.2}$	1
Q3.	Find the slope of tangent to the curve $x^2 + 3y + y^2 = 5$ at (1,1)	1
Q4.	Find the max. and min. values of f(x) = - Ix-1I + 5 without derivative.	1
Q5.	A particle moves along the curve $6y = x^3+2$. Find the points on the curve at which y – coordinate is changing 8 times as fast as the x – co-ordinate.	2
Q6.	Verify Rolle's theorem for the function $f(x) = x^2 – 5x + 6$ at [2,3]	2
Q7.	Find the equation of tangent to the cure $y = 5x^2 + 6x + 7$ at (1/2, 35/4)	2
Q8.	Find the equation (s) of normal (s) to the curve $3x^2 - y^2 = 8$ which is (are) parallel to the line x + 3y = 4.	4
Q9.	Find the intervals in which f(x) = sinx +cosx, $o \leq x \leq 2\pi$ is increasing or decreasing.	4
Q10.	Show that of all the rectangles inscribed in a given circle, the square has the maximum area.	6
Q11.	If the sum of the lengths of the hypotenuse and a side of a right angles trioangle is given, show that the area of the triangle is maximum when the angle between them is $\pi/3$.	6

Class XII – Chapter 7 (Integration)
Mathematics Test

Q1. a) $\int \frac{x^2 + 1}{x^4 + 1} dx$ b) $\int \frac{dx}{1 + 3\,Sin^2 x + 8\,Cos^2 x}$	**4+4=8**
Q2. Evaluate $\int \frac{dx}{Sin\,x - Sin\,2x}$	**2**
Q3. Evaluate $\int \frac{\sqrt{1 + Sin\,x}}{\sqrt{1 + Cosx}} e^{-\frac{x}{2}} dx$	**4**
Q4. Evaluate $\int_0^{\frac{\pi}{2}} \left(\sqrt{\tan x} + \sqrt{cotx}\right) dx$	**4**
Q5. Evaluate $\int_0^{\pi} \frac{x \tan x}{(Sec\,x + \tan x)} dx = \pi\left(\frac{\pi}{2} - 1\right)$	**4**
Q6. Evaluate $\int_0^{\frac{\pi}{2}} \frac{Sin^4 x}{Sin^4 x + Cos^4 x} dx$	**4**
Q7. $\int \frac{dx}{x^3 (x^5 + 1)^{3/5}}$	**2**
Q8. $\int \frac{x^4}{(x-1)(x^2+1)} dx$	**4**
Q9. $\int \sqrt{\frac{1 - \sqrt{x}}{1 + \sqrt{x}}} dx$	**2**
Q10. $\int (x - 3)\sqrt{x^2 + 3x - 18}\, dx$	**6**
Q11. Evaluate: $\int_2^5 \left(\lvert x-2 \rvert + \lvert x-3 \rvert + \lvert x-5 \rvert \right) dx$	**4**
Q12. Evaluate: $\int_1^4 (x^2 - x)\, dx$ as limit of sums	**4**
Q13. Find the value of $\int_{-\pi/2}^{\pi/2} \sin^7 x\, dx$	**2**

Class XII – Chapter 8 (Application of Integrals)
Mathematics Test

Q1. Find the area of the region bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$ **5**

Q2. Using Integration, find the area of region bounded by $x^2 + y^2 = 16$ and $y^2 = 6x$. **5**

Q3. Using the method of integration. Find the area of the region bounded by the lines
$3x-2y+1 = 0$, $2x + 3y - 21 = 0$ and $x - 5y + 9 = 0$ **5**

Q4. Prove that the curves $y^2 = 4x$ and $x^2 = 4y$ divide the area of the square bounded by $x = 0$, $x = 4$, $y = 4$ and $y = 0$ into three equal parts. **5**

Q5. Sketch the graph of $y = |x + 3|$ and evaluate the area under the curve $y = |x + 3|$ above x-axis and between $x = -6$ to $x = 0$ **5**

Q6. Using integration find the area of the following region:
$\left\{ (x, y) : |x+2| \le y \le \sqrt{20-x^2} \right\}$ **5**

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CLASS 12 SUBJECT Mathematics CHAPTER- 9 Differential Equation MM-30

Q1.	Determine the order and degree of the differential equation : $xy\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^3 - y.\ \frac{dy}{dx} = 0.$	1
Q2.	Show that y = x. sinx is a solution of the equation: $xy' = y + x\ \sqrt{x^2 - y^2}$.	1
Q3.	Form the differential equation corresponding to the curve $\frac{x}{a} + \frac{y}{y} = 1$	1
Q4.	Find the general solution of the different equation dy/dx = $\frac{1+y^2}{1+x^2}$	1
Q5.	Find the equation of the curve passing through the paint (1,1) whose differential equation is x . dy = $(2x^2+1)$dx.	2
Q6.	Find a particular solution of the differential equation : $(x^3 + x^2 + x + 1)\ \frac{dy}{dx} = 2x^2 + x$, y = 1 when x = 0.	2
Q7.	Find the particular solution of the differential equation $\log\left(\frac{dy}{dx}\right) = 3x + 4y$ given that y = 0 when x = 0.	2
Q8.	Show that the differential equation $(x - y)\ \frac{dy}{dx} = x + 2y$ is homogeneous and solve it.	4
Q9.	Show that the general solution of the different equation: $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right)\frac{dy}{dx} = 1.$	4
Q10.	Show t hat the general solution of the different equation $\frac{dy}{dx} + \frac{y^2+y+1}{x^2+x+1} = 0$ is given by (x + y + 1) = A (1 –x – y- 2xy).	6
Q11.	The volume of a spherical ballon being inflated changes at a constan state. If initially its radius is 3 units and after 3 sec. It is 6 units. Find the radius of the ballon after t seconds.	6

Class XII – Chapter 10 (Vectors)
Mathematics Test

Q1. Find λ, if $(2\hat{\imath} + 6\hat{\jmath} - 14\hat{k}) \times (\hat{\imath} - \lambda\hat{\jmath} + 7\hat{k}) = \vec{0}$ **2**

Q2. Find λ, if the projector of $\vec{a} = \lambda\hat{\imath} + \hat{\jmath} + 4\hat{k}$ on $\vec{b} = 2\hat{\imath} + 6\hat{\jmath} + 3\hat{k}$ is 4 units. **2**

Q3. Show that the vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ are coplanar if $\vec{a} + \vec{b}$, $\vec{b} + \vec{c}$, $\vec{c} + \vec{a}$ are coplanar. **2**

Q4. Find a unit vector perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where $\vec{a} = 3\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} - 2\hat{k}$. **2**

Q5. If $\vec{x} = 3\hat{\imath} + 4\hat{\jmath} + 5\hat{k}$ and $\vec{y} = 2\hat{\imath} + \hat{\jmath} - 4\hat{k}$ then express $\vec{y} = \vec{a} + \vec{b}$, where $\vec{a}$ is parallel to $\vec{x}$ and $\vec{b}$ is $\perp$ to $\vec{x}$. **4**

Q6. Let $\vec{a} = \hat{\imath} + 4\hat{\jmath} + 2\hat{k}$ and $\vec{b} = 3\hat{\imath} - 2\hat{\jmath} + 7\hat{k}$ $\vec{c} = 2\hat{\imath} - \hat{\jmath} + 4\hat{k}$. Find a vector $\vec{p}$ which is $\perp$ to both $\vec{a}$ and $\vec{b}$ and $\vec{p}.\vec{c} = 18$ **4**

Q7. The scaler product of the vector $\hat{\imath} + \hat{\jmath} + \hat{k}$ with the unit vector along the sum of vectors $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is 1. Find λ. **2**

Q8. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$, then find the angle between $\vec{a}$ and $\vec{b}$. **2**

Q9. The scalar product of the vector $\vec{a} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$ with a unit vector along the sum of vectors $\vec{b} = 2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\vec{c} = \lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ in equal to one. Find value of λ, and hence find unit vector along $\vec{b} + \vec{c}$. **4**

Q10.find the value of λ so that the vectors $\hat{\imath} + \hat{\jmath} + \hat{k}$, $2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $-\hat{\imath} + \lambda\hat{\jmath} + 2\hat{k}$ are coplanar. **2**

Q11. If $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$ then show that $(\vec{a} - \vec{d})$ is parallel to $(\vec{b} - \vec{c})$. **2**

Q12. If $\vec{a}, \vec{b}$ are unit vectors such that vector $\vec{a} + 3\vec{b}$ is $\perp$ to $7\vec{a} - 5\vec{b}$, then find the angle between $\vec{a}$ and $\vec{b}$. **2**