Brain International School

Vikas Puri, New Delhi

ASSIGNMENT NO. 1

SUBJECT: MATHEMATICS **CLASS-XII** **APRIL -MAY'2026**

Chapter 1 relations and functions

Ques1 Let A = {1, 2, 3,…, 9} and R be the relation in A x A defined by (a, b) R (c, d) if a + d = b + c for (a, b), (c, d) in A x A. Prove that R is an equivalence relation & also obtain the equivalent class [(2, 5)].

Ques2 Consider the set A= {1, 2, 3} and the relation R = {(1, 2), (1, 3)}. R is a transitive relation.

Ques3 Show that the function f: R → R be defined by f (x) = $\frac{x}{x^2+1}, \forall\ x\ \in$ R, is neither one – one and onto.

Ques4 Let f: R → R be the function defined by f(x) = $\frac{1}{2-cosx}\ \forall\ x \in R$ .Then, find range of f.

Ques5 Find the maximum number of equivalence relations on the set A = {1, 2, 3}.

Ques6 Let R be the relation on N x N defined by, $(a,b)R(\ c,d) \Leftrightarrow ad(c+b) = bc(a+d)$.SHOW EQ

Ques7 Prove that the relation R on the set Z of all integers defined by x R y $\Leftrightarrow x^y = y^x$

Chapter 2 INVERSE TRIGO

Ques1 Evaluate the following:

a) $\cos^{-1} x$ for x = $\frac{\sqrt{3}}{2}$ **b)** $\tan^{-1}\left(\sin\left(-\frac{\pi}{2}\right)\right)$ **c)** $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$

d) $\sin^{-1}\left[\cos\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)\right]$ **e)** $\text{Sec}\left(\tan^{-1}\frac{y}{2}\right)$ **f)** $\sin\left(2\tan^{-1}\frac{2}{3}\right) + cos\left(\tan^{-1}\sqrt{3}\right)$

g) Sin $(2\tan^{-1}(.75)$ **h)** $\text{Cos}\left[\sin^{-1}\frac{1}{4} + \sec^{-1}\frac{4}{3}\right]$ **i)** $\sin\left[\cot^{-1}\left(cos(\tan^{-1}1)\right)\right]$

j) $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$

CHAPTER 3 MATRIX

Ques1 Find the value of x if $[1 \quad x \quad 1]\begin{bmatrix}1 & 3 & 2\\ 2 & 5 & 1\\ 15 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\2\\x\end{bmatrix} = 0$

Ques2 If A = $\begin{bmatrix}0 & -x\\ x & 0\end{bmatrix}$, B = $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$ and $x^2 = -1$, then show that $(A + B)^2 = A^2 + B^2$

Ques3 If A = $\frac{1}{\pi}\begin{bmatrix}\sin^{-1}(x\pi) & \tan^{-1}\left(\frac{x}{\pi}\right)\\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x)\end{bmatrix}$, B = $\frac{1}{\pi}\begin{bmatrix}-\cos^{-1}(x\pi) & \tan^{-1}\left(\frac{x}{\pi}\right)\\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x)\end{bmatrix}$ then find A – B

Ques4 If the matrix $\begin{bmatrix}0 & a & 3\\ 2 & b & -1\\ c & -1 & 0\end{bmatrix}$ is a skew symmetric matrix, find the values a, b and c

Ques5 If A & B are symmetric matrices of the same order, then check whether is $(AB' - BA')$ is skew symmetric matrix or symmetric or null matrix.

CHAPTER 4 DETERMINANATS

Ques1 Find the value of λ so that the points (λ, 2-2λ), (- λ+1, 2λ) and (-4-λ, 6-2λ) are collinear?

Ques2 If $A^{-1} = \frac{1}{5}\begin{bmatrix}3 & -1\\ 1 & 2\end{bmatrix}$ and B = $\begin{bmatrix}0 & 3\\ 1 & 4\end{bmatrix}$, then find $(AB)^{-1}$

Ques3 Show that A = $\begin{bmatrix}5 & 3\\ -1 & -2\end{bmatrix}$ satisfies the equation x^2 - 3x – 7 = 0. Thus, find A^{-1}.

Ques4 If F(x)=$ax^2 + bx + c$ is a quadratic function such that f(1)=8, f(2)=11 and f(3)=6. Find f(X) using matrix method. Also find f(0)

Ques5 Let A = $\begin{bmatrix}1 & -2 & 1\\ -2 & 3 & 1\\ 1 & 1 & 5\end{bmatrix}$. Verify that: (i) $[adj\ A]^{-1}$ = adj. (A^{-1}) (ii) $(A^{-1})^{-1}$ = A.

Ques6 If A = $\begin{bmatrix}x & 0 & 1\\ 2 & -1 & 4\\ 1 & 2 & 0\end{bmatrix}$ is a singular matrix or has no inverse or fail to have unique solution, find x.

Ques7 Two schools A and B decided to award prizes to their students for three values honesty (x), punctuality (y) and obedience (z). School A decided to awards a total of Rs 11,000 for the three values to 5, 4 and 3 students respectively while school B decided to award Rs 10,700 for the values 4, 3 and 5 students, respectively. If all the three prizes amount to Rs 2700, then

(a) represent the above situation by a matrix equation and from linear equations using matrix multiplication.

(b) is it possible to solve the system of equations so obtained using matrices ?

Ques8 Three shopkeepers A, B, C are using polythene, handmade bags (prepared by prisoners), and newspaper's envelope as carry bags. It is found that the shopkeepers A, B, C are using (20,30,40), (30, 40,20), (40, 20,30) polythene, handmade bags and newspapers envelopes respectively. The shopkeepers A, B, C spent Rs 250, Rs 270 and Rs 200 on these carry bags respectively. find the cost of each carry bags using matrices.

Ques9 The ratio of incomes of two persons is 9: 7 and the ratio of their expenditures is 4: 3. If each of them manages to save Rs 2000 per month, find their monthly incomes.

Ques10 The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.

Q11 Use product $\begin{bmatrix}1 & -1 & 2\\ 0 & 2 & -3\\ 3 & -2 & 4\end{bmatrix}\begin{bmatrix}-2 & 0 & 1\\ 9 & 2 & -3\\ 6 & 1 & -2\end{bmatrix}$ to solve the system of equations

x + 3z = 9, -x + 2y – 2z = 4, 2x – 3y + 4z = - 3

Q12 Determine the product $\begin{bmatrix}-4 & 4 & 4\\ -7 & 1 & 3\\ 5 & -3 & -1\end{bmatrix}\begin{bmatrix}1 & -1 & 1\\ 1 & -2 & -2\\ 2 & 1 & 3\end{bmatrix}$ and use it to solve the system of equations: $x - y + z = 4$; $x - 2y - 2z = 9$, $2x + y + 3z = 1$.

Q13 A school wants to award its students for regularity and hard work with a total cash award of Rs 6,000. If three times the award money for hard work added to that given for regularity amount to Rs 11,000, represent the above situation algebraically and find the award money for each value, using matrix method. Suggest two more values, which the school must include for award.

Q14 If A = $\begin{bmatrix}2 & -3 & 5\\ 3 & 2 & -4\\ 1 & 1 & -2\end{bmatrix}$, find A^{-1}. Use it to solve the system of equations

2x – 3y + 5z = 11; 3x + 2y – 4z = -5; x + y – 2z = -3

Q15 Find the equation of the line joining A(1, 3) and B(0, 0) using determinants and find the value of k if D(k, 0) is a point such that area of triangle ABD is 3 square units.

CHAPTER CONINUITY & DIFFERENTIABILITY

Ques1 Show that the function f defined as follows, is continuous at $x = 2$ but not differentiable there at $f(x) = \begin{cases} 3x - 2, & 0 < x \leq 1 \\ 2x^2 - x, & 1 < x \leq 2 \\ 5x - 4, & x > 2 \end{cases}$

Ques2 Find the value of 'a' for which the function f is defined as $f(x) = \begin{cases} aSin\frac{\pi}{2}(x+1), x \leq 0 \\ \frac{tanx - sinx}{x^3}, & x > 0 \end{cases}$ is continuous at $x = 0$.

$f(x) = \begin{cases} ax + b, & x \leq 3 \\ bx + 3, & x > 3 \end{cases}$ is continuous at $x = 3$ **(2011 Outside)**

QueS 3 Show that function $f(x) = |x - 3|$ is a continuous but not differentiable at $x = 3$.

Ques4 Show that the function $f(x) = |x - 1| + |x + 1|$ is not differentiable at $x = 1$ & $x = -1$.

Ques5 Find $\frac{dy}{dx} y = sin^{-1}\{x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\}$

Ques6 Find $\frac{dy}{dx}$ if $y = (cosx)^x + (sinx)^{\frac{1}{x}}$

Ques7 Differentiate $x^{xcosx} + \frac{x^2-1}{x^2-1}$

Ques8 If $x = a(\theta - Sin\theta), y = a(1 + Cos\theta)$, find $\frac{d^2y}{dx^2}$

Ques9 If $(Cosx)^y = (Cosy)^x$ find $\frac{dy}{dx}$

Ques10 If $x = a(cost + t\ sint)$ and $y = a(sint - t\ cost)$, find $\frac{d^2y}{dx^2}, \frac{d^2x}{dt^2}\frac{d^2y}{dt^2}$

Ques11 Differentiate with respect to x: $(logx)^x + x^{logx}$

Ques12 Differentiate with respect to x: $sin^{-1}\left(\frac{2^{x+1}3^x}{1+(36)^x}\right)$

Ques13 If $x = a\ cos^3\theta$ and $y = aSin^3\theta$, then find the value of $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{6}$

Ques14 Differentiate $tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$ with respect to $cos^{-1}(2x\sqrt{1-x^2})$

Ques15 $tan^{-1}\left[\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right]$ find $\frac{dy}{dx}$

Ques16 If x = a Sin2t(1 + Cos2t) and y = b Cos2t(1 – Cos2t) find the value of $\frac{dy}{dx}$ at t = $\frac{\pi}{4}$ and t = $\frac{\pi}{3}$

Ques17 Find $\frac{dy}{dx}$ at x = 1 and y = $\frac{\pi}{4}$ if $Sin^2y + Cosxy = k$

Ques18 Differentiate the function $(Sin\ x)^x + \sin^{-1}\sqrt{x}$ w.r.t x

Ques19 If $x^y + y^x = a^b$ find $\frac{dy}{dx}$

Ques20 Differentiate $\tan^{-1}\left(\frac{1+\ cosx}{Sin\ x}\right)$ w.r.t. x

Ques21 If $(x^2\ +\ y^2)^2 = xy$ find $\frac{dy}{dx}$

Ques 22 If x = a(2t – Sin2t) and y = a(1 – Cos2t) find $\frac{dy}{dx}$ when t = $\frac{\pi}{3}$