WWW.MATHSTIMES.COM
HSC–10 Marks Questions not asked–(MARCH 06 to JUNE 16)
(1) APPLICATION OF MATRICES AND DETERMINANTS (15)

EXERCISE 1.1

(3) Find the adjoint of the matrix $A=\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$ and verify the result $\mathrm{A}(\mathrm{adj}\,\mathrm{A}) = (\mathrm{adj}\,\mathrm{A})\,\mathrm{A} = |\mathrm{A}|\,.\,\mathrm{I}$

(6) Find the inverse of the matrix $A=\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$ and verify that $A^3 = A^{-1}$.

(7) Show that the adjoint of $A=\begin{bmatrix}-1 & -2 & -2\\ 2 & 1 & -2\\ 2 & -2 & 1\end{bmatrix}$ is $3A^T$.

(9) If $A=\frac{1}{3}\begin{bmatrix}2 & 2 & 1\\ -2 & 1 & 2\\ 1 & -2 & 2\end{bmatrix}$, prove that $A^{-1} = A^T$.

EXERCISE 1.2

(4) Solve by matrix inversion method eachof the following system of linear equations:

$2x - y + z = 7,\ 3x + y - 5z = 13,\ x + y + z = 5$.

EXERCISE 1.4

(4) Solve the following non-homogeneous system of linear equations determinant method:

$x + y + z = 4;\ x - y + z = 2;\ 2x + y - z = 1$

(6) Solve the following non-homogeneous system of linear equations determinant method:

$3x + y - z = 2;\ 2x - y + 2z = 6;\ 2x + y - 2z = -2$

(7) Solve the following non-homogeneous system of linear equations determinant method:

$x + 2y + z = 6;\ 3x + 3y - z = 3;\ 2x + y - 2z = -3$

Example 1.4 : If $A=\begin{bmatrix}1 & 1 & 1\\ 1 & 2 & -3\\ 2 & -1 & 3\end{bmatrix}$,verify $A\,(adj\,A) = (adj\,A)\,A = |A|\,I_3$

Example 1.18: Solve the following non-homogeneous equations of three unknowns.

(2) $x + y + 2z = 6\ ;\ 3x + y - z = 2;\ 4x + 2y + z = 8$

(4) $x + y + 2z = 4\ ;\ 2x + 2y + 4z = 8\ ;\ 3x + 3y + 6z = 12$

Example 1.21: **Solve :** $x + y + 2z = 0\ ;\ 3x + 2y + z = 0\ ;\ 2x + y - z = 0$

Example 1.23 : Examine the consistency of the equations. $2x - 3y + 7z = 5,\ 3x + y - 3z = 13,\ 2x + 19y - 47z = 32$

Example 1.25: Verify whether the given system of equations is consistent. If it is consistent, solve them:

$x - y + z = 5,\ -x + y - z = -5,\ 2x - 2y + 2z = 10$

Example 1.27: Solve the following homogeneous linear equations. $x + 2y - 5z = 0,\quad 3x + 4y + 6z = 0,\quad x + y + z = 0$

(2) VECTOR ALGEBRA (0)

(3) COMPLEX NUMBERS (1)

EXERCISE 3.2

(8) (v) If P represents the variable complex number z. Find the locus of P, if $\arg\left(\frac{z-1}{z+3}\right)=\frac{\pi}{2}$

(4) ANALYTICAL GEOMETRY (1)

EXERCISE 4.2

(6) Find the eccentricity, centre, foci, vertices of the following ellipses and draw the diagram:
(ii) $x^2+4y^2-8x-16y-68=0$

(5) DIFFERENTIAL CALCULUS APPLICATION – (12)

EXERCISE 5.1

(9) Gravel is being dumped from a conveyor belt at a rate of 30 ft3 / min and its coarsened such that it forms a pile in the shape of a cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 ft high?

Example 5.14 : Find the equations of tangent and normal to the curve $16x^2+9y^2=144$ at (x_1, y_1) where $x_1=2$ and $y_1>0$.

Example 5.15 : Find the equations of the tangent and normal to the ellipse $x=a\cos\theta,\ y=b\sin\theta$ at the point $\theta=\frac{\pi}{4}$.

EXERCISE 5.2

(5) Find the equations of those tangents to the circle $x^2+y^2=52$,which are parallel to the straight line $2x+3y=6$.

Example 5.35 : Evaluate : $\lim_{x\to 0+} x^{\sin x}$

EXERCISE 5.9

(3) Find the local maximum and minimum values of the following functions:
(iii) x^4-6x^2 (iv) $(x^2-1)^3$ (v) $\sin^2\theta\ [0,\pi]$ (vi) $t+\cos t$

Example 5.52 : A farmer has 2400 feet of fencing and want to fence of a rectangular field that borders a straight river. He needs no fence along the river. What ar the dimensions of the field that has the largest area?

Example 5.63 : Discuss the curve $y=x^4-4x^3$ with respect to concavity and points of inflection.

EXERCISE 5.11

(5) Find the intervals of concavity and the points of inflection of the function $f(\theta)=\sin 2\theta$ in $(0,\pi)$

(6) DIFFERENTIAL CALCULUS APPLICATION - II (1)

Example 6.18 : If $w = u^2 e^v$ where $u = \frac{x}{y}$ and $v = y \log x$, find $\frac{\partial w}{\partial x}$ and $\frac{\partial w}{\partial y}$

(7) INTEGRAL CALCULUS (4)

Example 7.26 : Find the area between the line $y = x + 1$ and the curve $y = x^2 - 1.$

Example 7.28 : Find the area of the region enclosed by $y^2 = x$ and $y = x - 2$

Example 7.31 : Find the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Example 7.32 : Find the area of the curve $y^2 = (x-5)^2 (x-6)$ (i) between x = 5 and x = 6 (ii) between x = 6 and x = 7

(8) DIFFERENTIAL EQUATIONS (4)

Example 8.13 : Solve : $\left(2\sqrt{xy} - x\right)dy + y\,dx = 0$

Example 8.15 : Solve : $\left(1 + e^{x/y}\right)dx + e^{x/y}\left(1 - x/y\right) dy = 0$ given that $y = 1,$ where $x = 0$

EXERCISE 8.4 Solve : (5) $\frac{dy}{dx} + \frac{y}{x} = \sin\left(x^2\right)$

Example 8.38 : A drug is excreted in a patients urine. The urine is monitored continuously using a catheter. A patient is administered 10 mg of drug at time t = 0 , which is excreted at a Rate of $-3t^{1/2}$ mg/h.

(i) What is the general equation for the amount of drug in the patient at time t > 0 ?

(ii) When will the patient be drug free?

(9) DISCRETE MATHEMATICS (1)

Example 9.22 : Show that the set $G = \left\{a + b\sqrt{2} \;/\; a,\ b \in Q\right\}$ is an infinite abelian group with respect to addition.

(10) PBOBABILITY DISTRIBUTIONS (0)

****