Sample Paper- 2015
Subject: Mathematics
Class 12th

Time allowed: 3 hours **Maximum Marks: 100**

General instructions:

a. All questions are compulsory.
b. Question number 1 to 10 is of 1 mark each. Question numbers 11 to 22 are of 4 marks each. Question numbers 23to 29 are of 6 marks each.
c. Internal choices have been provided in some questions. You have to attempt only one of the choices in such questions.
d. Use of calculator is not permitted

1. Find the matrix X, if X+$\begin{bmatrix} 2 & 6 \\ -3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & -3 \\ 3 & -5 \end{bmatrix}$
2. If $f(x)$ is aninvertible function, find the inverse of f(x)=$\frac{3x-2}{5}$
3. Evaluate:$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} si\,n^3 dx$
4. Evaluate: $\int \sin^{-1}(\cos x)dx$
5. Evaluate: $\sin\left\{\frac{\pi}{2} - \sin^{-1}\frac{-\sqrt{3}}{2}\right\}$
6. Find the cofactor ofa_{21} in the$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$
7. If A=$\begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$,, find the inverse of A.
8. Find the area of the parallelogram whose adjacent sides are the vectors 3i^+j^-2k^and i^-3j^+4k^..
9. Find the equation of the plane which is parallel to the plane $2x - y + 2z - 5 = 0$ which passes through the point (1, 1, 1).
10. Find the length of the perpendicular from the point 2i^+j^-k^ to the plane r.(i^-2j^+4k^)=9.
11. Show that the equation of normal to the curve $x^2 = 4y$which passes through the point (1, 2)..
12. Find the interval on which the function f(x)=$2x^3$-$15x^2$+36x+6is increasing or decreasing

    OR

    Differentiate w.r.to x:$\tan^{-1}\left\{\sqrt{\frac{1+sinx}{1-sinx}}\right\}$
13. Show that the relation'*' on$Z$ defined by $a * b = a + b + 1$for all $a, b \in Z$, satisfies closure property . Also find the identity element in Z. What is the inverse of an element $a \in Z$?
14. Evaluate:$\int \frac{2x}{(x^2+2)(x^2+_3)} dx$

    OR

$$\int \frac{1}{x^2+8x+4}dx$$

15. If y=$\tan^{-1}\sqrt{x^2-1}$, then show that$x(x^2-1)y_2-(2x^2-1)y_1=0$

16. A bag X contains 2 white and 3 red balls and abag Y contains 4 white and 5red balls. One ball is drawn at random from one of the bag and is found to be red. Find the probability that it was drawn from bag Y?

OR

Three persons A, B and C throw a coin alternatively till one of them gets a 'head' and wins the game. Find their respective probabilities of winning, if A starts the game followed by B and C.

17. Using the properties of determinant prove that$\begin{vmatrix} a+b+2c & c & c \\ a & 2a+b+c & a \\ b & b & a+2b+c \end{vmatrix}=2(a+b+c)^2$.

18. Solve the differential equation$(x^2+3y^2)dx=2xydy$..

19. Solve the differential equation$(1-x^2)\frac{dy}{dx}+2xy=\sqrt[x]{1-x^2}$.

20. Find the equation of the plane passing through the point P (-1, -1, 2) and Q (2, -2, 2) perpendicular to theplane x+2y+2z=5.

OR

Find the image of the point (1, 2, 3) in the plane x+2y+4z=38.

21. Prove that$\tan^{-1}\frac{1}{4}+\tan^{-1}\frac{2}{9}=\frac{1}{2}\tan^{-1}\frac{4}{3}$

22. Find a vector whose magnitude is 3 units and which is perpendicular to the following vectorsand a=3i^+j^-4k^ and b=6i^+5j^-2k^

23. Given A=$\begin{vmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{vmatrix}$and B=$\begin{vmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{vmatrix}$, find *AB* and use this result in solving the system of equations: x- y+ z= 4, x-2y-2z=9, 2x+y+3z=1

24. Find the equation of the plane passing through the point (1,2, 3) and (0, -1, 0) and parallel to the line$\frac{x-1}{2}=\frac{y+2}{3}=\frac{z}{-3}$..

25. A coin is tossed 4 times. If X is the number of heads observed, find the probability distribution of X. Also find the variance?

26. A dietician wishes to mix together two kinds of food X and Y in such a way that the mixture containsat least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin C. The vitamin contents of 1 kg food is given below:

Food	**Vitamin A**	**Vitamin B**	**Vitamin C**
X	1	2	3
Y	2	2	1

One kg of food X costs 16 and one kg of food Y costs 20. Find the least cost of the mixture which will produce the required diet?

27. Show that the semi-vertical angle of a right circular cone of maximum volume and slant height is $\tan^{-1}\sqrt{2}$

OR

An open box with a square base is to be made out of a given quantity of cardboard of area a^2 sq unit. Find the dimensions of the box so that the volume of the box is maximum. Also find the maximum volume.

28. Evaluate: $\int_1^4 (x^2+2)dx$ as limit of sums.

OR

Sketch the region and find the area bounded by the circle $x^2+y^2=16$ and the line y = x in the first quadrant..

29. Prove that $\int_0^{\pi} \frac{x\tan x}{\sec x \cos ecx} dx = \frac{\pi^2}{4}$