

Sample Paper – 2015
Class – XII
Mathematics

Time: 3 hours

Max marks: 100

Section--A

Q1. Let Z be the set of all integers and let R be a relation in Z , defined by $R = \{(a, b) : (a-b) \text{ is even}\}$ show that R is an equivalence relation in Z

Q2. Find the matrix X such that $2A - B + X = 0$ where $A = \begin{vmatrix} 3 & 1 \\ 0 & 2 \end{vmatrix}$ and $B = \begin{vmatrix} -2 & 1 \\ 0 & 3 \end{vmatrix}$

Q3. Solve for x $\tan^{-1}2x + \tan^{-1}3x = \pi/4$

Q4. Find the value of x and y if $2 \begin{pmatrix} X & 5 \\ 7y & -3 \end{pmatrix} \begin{pmatrix} 3 & 4 \\ +1 & 2 \end{pmatrix} = \begin{pmatrix} 7 & 14 \\ 15 & 14 \end{pmatrix}$

Q5. If $A = \begin{pmatrix} 2 & -2 \\ -3 & 4 \end{pmatrix}$ then find $(-A^2 + 6A)$

Q6. If $\vec{a} = (5\hat{i} - \hat{j} - 3\hat{k})$ and $\vec{b} = (\hat{i} + 3\hat{j} - 5\hat{k})$ then show that $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ are perpendicular to each other

Q7. If \vec{a} and \vec{b} are vectors such that $\vec{a} = 2\vec{b}$, $|\vec{a}| = 3$ and $\vec{a} + \vec{b} = 4$. Find $|\vec{a} - \vec{b}|$

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Q8 evaluate $\int \log \frac{2-x}{2+x} dx$.

-1

Q9 find the approximate value of $\sqrt{0.48}$

Q10. Find the slope of the tangent to the curve

$Y = (\sin 2x + \cot x + 2)^2$ at $x = \pi/2$

Section-B

Q11. Prove that $\tan^{-1} \frac{\sqrt{1+x^2} + \sqrt{1-x^2} - \pi}{\sqrt{1+x^2} - \sqrt{1-x^2}} + \frac{1}{4} \cos^{-1} x^2$

Q12. Prove that $\begin{bmatrix} -bc & b^2 + bc & c^2 + bc \\ a^2 + ac & -ac & c^2 + ac \\ a^2 + ab & b^2 + ab & -ab \end{bmatrix} = (ab + bc + ca)^3$

Q13. Test the continuity of function $f(x) = \frac{x^4-16}{x-2}$ if $x \neq 2$ At $x = 2$

Q14. Differentiate $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ w.r.t $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$

Q15. Separate the interval $[0, \pi/2]$ into sub-intervals in which $f(x) = \sin^4 x + \cos^4 x$ is (a) increasing (b) decreasing

Q16. Evaluate $\int \sin^{-1} \frac{\sqrt{x}}{a+x} dx$

Or

Evaluate $\int \frac{\sin^{-1} x}{(1-x^2)} dx$

Q17. Solve the differential equation $(x^3-3xy^2) dx = (y^3-3x^2y) dy$

Or

$(1+x^2) dy/dx - 2xy = (x^2+2)(x^2+1)$

Q18. Solve the differential equation

$\frac{dy}{dx} + y \cot x = 2x + x^2 \cot x$ given that $y(0)=0$

Q19. if a, b, c are vectors such that $|a| = 5, |b| = 4, |c| = 3$ and each is perpendicular to the sum of the other two, find $|a + b + c|$

Q20. Find the equation of the plane through the line of intersection of planes $2x+y-z=3$ and $5x-3y+4z+9=0$ and

Parallel to the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-5}{5}$

Q21 let N be the set of all natural numbers and let R be a Relation in N , defined by

$R = \{(a, b) : a \text{ is a factor of } b\}$ then, show that R is reflexive and transitive but not symmetric

Q22. A die is thrown twice and the sum of the numbers appearing is observed to be 8. what is the conditional probability that the number 5 has appeared at least once

Section –c

Q23. Given that $A = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$, find AB . Use this to solve the following

system of Linear equations:

$x+z=4, x-2y-2z=9, 2x+y+3z=1$

Q24. Sketch the region common to the circle $x^2+y^2=16$ and parabola $y^2=6x$. Also find the area of region, using the integration

Q25. Evaluate $\int_0^{\pi/2} \frac{\sin 2x}{(1+\sin x \cos x)}$

Or

Evaluate $\int f(x) dx$, where $f(x) = |x-1| + |x-2| + |x-3|$

Q26. Find the image of the point (1, 6, 3) in the line $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z-2}{3}$

Q27. A man known to speak the truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

Q28. An open box with a square base is to be made out of a given cardboard of area c^2 square units. Show that the maximum volume of the box is $\frac{c^3}{6\sqrt{3}}$ cubic units.

Or

Find the largest possible area of right-angled triangle whose hypotenuse is 5 cm.

Q29. If a Youngman rides his motorcycle at 25 km/hr he has to spend Rs2, per km on petrol; if he rides it at a faster speed of 40 km/hr, the petrol cost increases to 5 Rs per km. He has Rs 100 to spend on petrol and wishes to find the maximum distance he can travel with in one hour. Express this as a linear problem and then solve it.