

DELHI PUBLIC SCHOOL, JAMMU
ASSIGNMENT PRE-BOARD I

CLASS 12TH
SUB: MATHEMATICS

Session: 2017-18

SECTION A (1 mark each)

Q1. If A is a matrix of order 2X3 and B is of order 3X4, what is the order of (AB)'.

Q2. If \vec{p} is a unit vector and $(\vec{x} - \vec{p}) \cdot (\vec{x} + \vec{p}) = 80$, then find the value of $|\vec{x}|$.

Q3. Evaluate $\int_2^3 \frac{1}{2x} dx$.

Q4. Find the point in which tangent to the curve $y = x^2$ makes an angle of 45° with x-axis .

SECTION B (2 marks each)

Q5. Express the matrix $A = \begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix}$ as the sum of symmetric and skew symmetric matrix.

Q6. If $x^y = y^x$, find $\frac{dy}{dx}$.

Q7. Verify Rolle's theorem for $f(x) = \sin 2x$ in $[0, \frac{\pi}{2}]$ and find the value of $c \in]0, \frac{\pi}{2}[$.

Q8. Discuss continuity of the function at $x = 0$, $f(x) = \begin{cases} \frac{x^4 + 2x^3 + x^2}{\tan^{-1} x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$

Q9. Find the coordinate of point of intersection $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{y-4}{4} = \frac{z-5}{3}$.

Q10. If $P(A) = \frac{1}{4}$, $P(A|B) = \frac{1}{2}$, $P(B|A) = \frac{2}{3}$ then find $P(B)$.

Q11. If $3\tan^{-1} x + \cot^{-1} x = \pi$, then find the value of x .

Q12. Evaluate $\int \frac{\sqrt{x^2+1}[\log(x^2+1) - 2\log x]}{x^4} dx, x > 0$.

SECTION C (4 marks each)

Q13. Differentiate $\tan^{-1} \frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}}$ with respect to $\cos^{-1} x^2$.

Q14. Find the equation of plane passing through the points A(3,2,1), B(4,2,-2) and C (6,5,-1) and hence find the

value of λ for which A(3,2,1), B(4,2,-2) and C (6,5,-1) and D(λ , 5, 5) are coplanar.

Q15. The scalar product of the vector $\hat{i} + \hat{j} + \hat{k}$ with a unit vector along the sum of vectors $2\hat{i} + 4\hat{j} - 5\hat{k}$ and

$\lambda \hat{i} + 2\hat{j} + 3\hat{k}$ is equal to one .Find the value for λ .

Q16. Using the properties of determinants ,prove that:
$$\begin{vmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{vmatrix}$$

=2(a+b)(b+c)(c+a)

Q17. If $x = \sin t$, $y = \sin pt$ then prove that: $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + p^2y = 0$
(or)

If $y = x \log\left(\frac{x}{a+bx}\right)$, then prove that: $\frac{d^2y}{dx^2} = \frac{1}{x}\left(\frac{a}{a+bx}\right)^2$.

Q18. Evaluate: $\int (x-3)\sqrt{x^2+3x-18} dx$.

(or)

Evaluate: $\int \frac{6x+7}{\sqrt{x^2-9x+20}} dx$

Q19. Solve the differential equation: $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^3$

Q20. Evaluate: $\int_0^{\pi/2} \frac{x \sin x \cos x}{\cos^4 x + \sin^4 x} dx$

Q21. A and B throw a die alternately till one of them gets a 5 and wins the game. Find their respective probabilities of winning if A starts the game. Why gambling is not good way of earning money?

Q22. In a bolt factory, machine A, B, C manufacture respectively 25%, 35% and 40% of the bolts. Of their output, 5%, 4% and 2% are respectively defective bolts. A bolt is drawn at random from the total production and is found to be defective. Find the probability that it is manufactured by machine B.

Q23. A binary operation $*$ on the set $\{0, 1, 2, 3, 4, 5\}$ is defined as

$a * b = \begin{cases} a + b & \text{if } a + b < 6 \\ a + b - 6, & \text{if } a + b \geq 6 \end{cases}$. Show that zero is the identity element for this binary

operation and each non-zero element a of the set is invertible with $6-a$ being inverse of a .

SECTION D (6 marks each)

Q24. If $A = \begin{pmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{pmatrix}$ are two matrices, then find AB . Hence using the product, solve the following system of equations. $x - y = 3, 2x + 3y + 4z = 17, y + 2z = 7$

Q25. Using integration find the area bounded by the lines $x + 2y = 2, y - x = 1$ and $2x + y = 7$

Q26. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone.

Q27. A dealer wishes to purchase a number of fans and sewing machines. He has only rupees 5760 to invest and has space for at most 20 items. A fan cost him rupees 360 and a sewing machine rupees 240. On selling he get a profit of rupees 20 on a fan and rupees 18 on a sewing machine. Assuming that he can sell all the items that he store, how should he invest his money to maximize profit? Formulate an L.P.P and solve it graphically.

Q28. Find the image of the point $(1, 2, 3)$ in the plane $x + 2y + 4z = 38$

Q29. Show that the equation $xy - ydx = \sqrt{x^2 + y^2} dx$ is homogenous and hence solve it.