



INDIAN SCHOOL AL WADI AL KABIR

Revision Questions MATHEMATICS (041)

Class: XII

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SECTION A

- Q.1. If $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ 2 \end{bmatrix}$, then the value of $(2x + y - z)$ is : 1
- A 1 B 2 C 3 D 5
- Q2. If $\sqrt{x} + \sqrt{y} = \sqrt{a}$, then $\frac{dy}{dx}$ 1
- A. $-\frac{\sqrt{x}}{\sqrt{y}}$ B. $\frac{\sqrt{x}}{\sqrt{y}}$ C. $-\frac{\sqrt{y}}{\sqrt{x}}$ D. $\frac{\sqrt{ax}}{\sqrt{y}}$
- Q3. $x^3 - 3x$ is strictly decreasing in: 1
- A $(-\infty, -1)$ B $(1, \infty)$ C $(-1, 1)$ D $(0, \infty)$
- Q4. Which of the following is not true for a square matrix A? 1
- A $A^{-1} = \frac{adjA}{|A|}$ B $(A^{-1})^{-1} = A$ C $|adjA| = |A|^n$ D $|A| = |A|^T$
- Q5. If a matrix A is both symmetric and skew-symmetric, then 1
- A A is a diagonal matrix B A is a zero square matrix C A is a scalar matrix D A is a square matrix
- Q6. If $f(x) = \begin{cases} \frac{1 - \cos 2x}{x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, then k: 1
- A 2 B 1 C -1 D 0
- Q7. If $x = t^2, y = t^3$, then $\frac{d^2y}{dx^2}$ 1
- A $\frac{3}{2}$ B $\frac{3}{4t}$ C $\frac{3}{4}$ D $\frac{3t}{4}$
- Q8. Maximum value of $\begin{vmatrix} \cos x & \sin x \\ \sin x & \cos x \end{vmatrix}$ 1
- A 1 B 2 C 0 D 4

Q9 The total revenue in Rupees received from the sale of x units of a product is given by $R(x) = 13x^2 + 26x + 15$. Marginal revenue when $x = 7$ is: 1

A ₹208 B ₹192 C ₹223 D ₹834

Q10. $f(x) = x^3 - 3x^2 + 4x, x \in \mathbf{R}$, is: 1

A increasing in \mathbf{R} B decreasing in \mathbf{R} C neither increasing nor decreasing in \mathbf{R} D decreasing in $(-\infty, 0)$

In the following questions (Q11 to Q14) a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- A) Both A and R are true and R is the correct explanation of A.
- B) Both A and R are true but R is not the correct explanation of A.
- C) A is true but R is false.
- D) A is false but R is true.

Q11 **Assertion (A):** If A and B are symmetric matrices then $AB - BA$ is a symmetric matrix. 1

Reason (R): For a skew symmetric matrix $A = [a_{ij}]$, $a_{ij} = 0$ if $i = j$.

Q12 **Assertion:** $y = x^x$ has a critical point at e^{-1} . 1
Reason: A point c in the domain of a function f at which either $f'(c) = 0$ or f is not differentiable is called a *critical point* of f .

Q13. **Assertion:** $f(x) = |x - 1|$ is continuous and but not differentiable at $x = 1$. 1
Reason: A function is differentiable at $x=c$, if LHD = RHD at $x= c$.

Q14. **Assertion:** $\begin{bmatrix} 0 & 0 & 5 \\ 0 & 5 & 0 \\ 5 & 0 & 0 \end{bmatrix}$ is a scalar matrix. 1
Reason: A diagonal matrix is said to be a *scalar matrix* if its diagonal elements are equal.

SECTION B

Q15. **Compute the indicated product:** $\begin{bmatrix} 3 & 2 \\ 1 & 4 \\ 5 & 3 \end{bmatrix} \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$ 2

Q16. $A = [a_{ij}]$ where A is 2×2 matrix and $a_{ij} = \frac{i^2 + 2j}{2}$, then write all elements of A. 2

Q17. Evaluate the local maximum value of the function $f(x) = \frac{x}{2} + \frac{2}{x}$. 2

Q18. Find $\frac{dy}{dx}$ if $x^2 + y^2 + xy = 10$ 2

Q19. Solve using matrices: $3x + 4y = 2$; $5x - y = 11$. 2

Q20. Express the matrix A as the sum of a symmetric matrix and a skew symmetric matrix, 2
 where $A = \begin{bmatrix} 4 & 3 & -2 \\ 0 & 5 & 1 \\ -2 & 2 & -3 \end{bmatrix}$

SECTION C

Q21. If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ then prove $A^2 - 3A - 7I = 0$. Hence find A^{-1} 3

Q22. If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ find A^{-1} 3

Q23. Solve using matrices: $2x + y + z = 13$; $2x - y = 10$; $x - y + z = 8$. 3

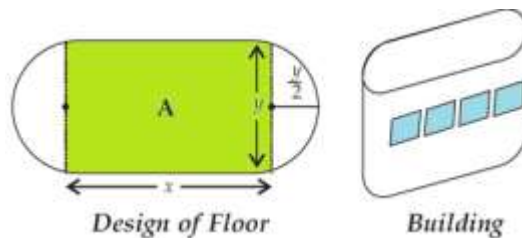
Q24. Differentiate with respect to x : $(\log x)^x + x^{\log x}$ 3

Q25. Show that the surface area of a closed cuboid with a square base and given volume is minimum, when it is a cube. 3

Q26. Find the intervals in which the function f given by $f(x) = 4x^3 - 6x^2 - 72x + 30$ is
 (a) increasing (b) decreasing.

SECTION D Case study-based questions

Q27. Read the following passage and answer the questions given below. An architect designs a building for a multinational company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200 m as shown here:



- (i) Find the area of the rectangular region A expressed as a function of x . 2
- (ii) Find the maximum value of area A (rectangular region). 2

Q28. A window is in the form of a rectangle surmounted by an equilateral triangle on its length. Let the rectangular part have length and breadth x and y metres respectively.

Based on the given information, answer the following questions :

- (i) If the perimeter of the window is 12 m, find the relation between x and y . 1
- (ii) Using the expression obtained in (i), write an expression for the area of the window as a function of x only. 1
- (iii) (a) Find the dimensions of the rectangle that will allow maximum light through the window. (use expression obtained in (ii)) 2

OR

- (iii) (b) If it is given that the area of the window is 50 m^2 , find an expression for its perimeter in terms of x . 2

Q29. A manufacturer produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets. Annual sales are indicated below

Market	Products (in numbers)		
	Pencil	Eraser	Sharpener
A	10,000	2,000	18,000
B	6,000	20,000	8,000



If the unit Sale price of Pencil, Eraser and Sharpener are ₹ 2.50, ₹1.50 and ₹ 1.00 respectively, and unit cost of the above three commodities are ₹ 2.00, ₹ 1.00 and ₹ 0.50 respectively, then,

- (i) Find the total revenue of market A. 1
 - (ii) Find the total revenue of market B 1
 - (iii) a) What is the cost incurred in market A 1
- Or
- b) Find the total profit earned in market A and B. 2

ANSWER

Q1	D	Q2	C	Q3	C
Q4	C	Q5	B	Q6	B
Q7	B	Q8	A	Q9	A
Q10	A	Q11	D	Q12	A
Q13	A	Q14	D	Q15	$\begin{bmatrix} 11 & 2 \\ 7 & 14 \\ 18 & 2 \end{bmatrix}$
Q16	$\begin{bmatrix} 3 & 5 \\ 2 & 2 \\ 3 & 4 \end{bmatrix}$	Q17	Local Maximum value = -2	Q18	$\frac{dy}{dx} = -\frac{(2x+y)}{2y+x}$
Q19	$x=2, y=-1$	Q20	$\begin{bmatrix} 4 & 1.5 & -2 \\ 1.5 & 5 & 1.5 \\ -2 & 1.5 & -3 \end{bmatrix}_+$		$\begin{bmatrix} 0 & 1.5 & 0 \\ -1.5 & 0 & -0.5 \\ 0 & 0.5 & 0 \end{bmatrix}$
Q21	$\frac{1}{7} \begin{bmatrix} 2 & 3 \\ -1 & -5 \end{bmatrix}$	Q22	$= \begin{bmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$	Q23	$x = 5, y = 0, z = 3$
Q24	$(\log x)^x \left(\log(\log x) + \frac{1}{\log x} \right) + \frac{x^{\log x} \cdot 2 \log x}{x}$			Q26	increasing in $(-\infty, -2)$ and $(3, \infty)$ decreasing in $(-2, 3)$.
Q27	i) $A = x \left(\frac{200-2x}{\pi} \right)$ ii) Max area at $x=50$, Area = $\frac{5000}{\pi}$ sq.m				
Q28.	(i) Perimeter (P) = $3x + 2y = 12$ (ii) Area = $6x - \frac{3}{2}x^2 + \frac{\sqrt{3}}{4}x^2$ iii) $x = \frac{12}{6-\sqrt{3}} m \quad y = \frac{12-3x}{2} = 6 - \frac{3}{2} \left(\frac{12}{6-\sqrt{3}} \right) = \frac{18-6\sqrt{3}}{6-\sqrt{3}} m$ OR $P = 3x + 2y$ $= 3x + 2 \left(\frac{50}{x} - \frac{\sqrt{3}}{4}x \right) m$				
Q27	i) ₹46000 ii) ₹53000 iii) ₹31000 OR ₹32000				
