MATHS

BOOKS - ARIHANT PRAKASHAN

DETERMINANTS

Topic 1 Practice Questions 1 Mark Questions

1. IF $\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix} = a + bx + cx^2 + dx^3 + ex^4 + fx^5$

then write the value of a.

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2. If evey element of a third order determinant of value 8 is multiplied by 2, then write the value of the new determinant.

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3. IF $\begin{bmatrix} 3 & 5 & 3 \\ 2 & 4 & 2 \\ \lambda & 7 & 6 \end{bmatrix}$ is a singular matrix, then write the value of λ

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4. if a_{ij} is the element in the ith row and jth column of a 3rd order determinant whose value is 1 and c_{ij} is the cofactor of a_{ij} then what is value of $a_{11}(c_{11} + c_{21}) + a_{12}(c_{12} + c_{22}) + a_{13}(c_{13} + c_{23})$?

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5. Determine the maximum value of

$$\begin{vmatrix} \cos x & \sin x \\ -\sin x & \cos x - 1 \end{vmatrix}$$

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6. Write the value of k, if

$$\begin{vmatrix} aa_1 & aa_2 & aa_3 \\ ab_1 & ab_2 & ab_3 \\ ac_1 & ac_2 & ac_3 \end{vmatrix} = k \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

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7. Evaluate the following determinants. $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$

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8. Evaluate the following : $\begin{bmatrix} \sin^2\theta & \cos^2\theta & 1 \\ \cos^2\theta & \sin^2\theta & 1 \\ -10 & 12 & 2 \end{bmatrix}$

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9. IF ω and ω^2 are the complex cube roots of unity, write the value of the following determinant.

$$\begin{vmatrix} \cos^2 x & -1 & \sin^2 x \\ -2 & 1 & 1 \\ \omega & \omega^2 & 1 \end{vmatrix}$$

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10. If evey element of a third order determinant of value 8 is multiplied by 2, then write the value of the new determinant.

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11. If all the elements on the two diagonals of a third order determinant are zero, then what is the value of the determinant.

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12. IF the coafactor and minor of each element of a second order determinant are same, then what is the value of the element is the second row and first column of determinant.

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13. Without expanding , show that

$$\begin{vmatrix} x & a & x+a \\ y & b & y+b \\ z & c & z+a \end{vmatrix} = 0$$

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14. Fill in the blanks with appropriate answer from the brackes.

$$\begin{bmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{bmatrix}$$ =______

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15. Find the equation of the line joining (2,3) and (-1,2) using determinants.

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16. For what value of matrix $\begin{bmatrix} 6-x & 4 \\ 3-x & 1 \end{bmatrix}$ is a singular matrix?

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Topic 1 Practice Questions 4 Mark Questions

1. Solve the following : $\begin{bmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{bmatrix}$=0

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2. Prove that the following.

$$\begin{bmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{bmatrix} = (a+b+c)^3$$

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3. Show that $(a+1)$ is a factor of $\begin{vmatrix} (a+1) & 2 & 3 \\ 1 & a+1 & 3 \\ 3 & -6 & a+1 \end{vmatrix}$

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4. Prove that the following.

$$\begin{bmatrix} a & b & c \\ x & y & z \\ p & q & r \end{bmatrix} = \begin{bmatrix} y & b & q \\ x & a & p \\ z & c & r \end{bmatrix} = \begin{bmatrix} x & y & z \\ p & q & r \\ a & b & c \end{bmatrix}$$

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5. Find the value of $\begin{vmatrix} 17 & 58 & 97 \\ 19 & 60 & 99 \\ 18 & 59 & 98 \end{vmatrix}$ without expanding.

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6. Solve for x,

$$\begin{vmatrix} 15-2x & 11 & 10 \\ 11-3x & 17 & 16 \\ 7-x & 14 & 13 \end{vmatrix} = 0$$

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7. Find the value of k if the points (k+1,1),(2k+1,3) and (2k+2,2k) are collinear.

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8. Evaluate the following determinants:

$$\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$$

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9. Find the inverse of $\begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix}$

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Topic 1 Practice Questions 6 Mark Questions

1. Prove the following:

$$\begin{bmatrix} (b+c)^2 & a^2 & bc \\ (c+a)^2 & b^2 & ca \\ (a+b)^2 & c^2 & ab \end{bmatrix}$$

$=\left(a^2+b^2+c^2\right)(a+b+c)(b-c)(c-a)(a-b)$

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2. Show that

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

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3. Prove that the following. $\begin{bmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{bmatrix}$

= abc(1+1/a+/b+1/c)

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4. Prove that

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$$

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5. If a, b and c are all positive real, then prove that minimum value of determinant

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} = 1+a^2+b^2+c^2$$

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6. Prove the following:

$$\begin{bmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{bmatrix}$$

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

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7. Let a,b and c are real number and

$$\Delta = \begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$$

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Topic Test 1

1. IF $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ -1 & 1 \end{bmatrix}$ then write the value of [AB].

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2. IF $A = \begin{bmatrix} 5 & 6 & -3 \\ -4 & 3 & 2 \\ -4 & -7 & 3 \end{bmatrix}$ then write the cofactor of the element a_{21} of its 2nd row.

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3. If $\begin{bmatrix} x+1 & x-1 \\ x-3 & x+2 \end{bmatrix} = \begin{bmatrix} 4 & -1 \\ 1 & 3 \end{bmatrix}$ then write the value of x.

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4. If $\Delta = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 1 \\ 5 & 3 & 8 \end{bmatrix}$ then write the minor of element a_{23}

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5. Write the value of the determinant $\begin{vmatrix} p & p+1 \\ p-1 & p \end{vmatrix}$

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6. Using properties of determinants prove that

$$\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix} = (a-1)^3$$

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7. Prove that the following. $\begin{bmatrix}(a+1)(a+2) & a+2 & 1\\(a+2)(a+3) & a+3 & 1\\(a+3)(a+4) & a+4 & 1\end{bmatrix}$=-2

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8. Using properties of determinants prove that

$$\begin{vmatrix}a+x & y & z\\x & a+y & z\\x & y & a+z\end{vmatrix} = a^2(a+x+y+z)$$

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9. Find the ara of the triangle, whose vertices are (3,8) (-4,2) and (5,1).

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10. IF the area of a triangle with vertices (-3,0) (3,0) and (0,k) is 9 sq units. Then find k.

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Topic 2 Practice Questions 1 Mark Questions

1. If A is a 3×3 matrix and $|A| = 2$, then which matrix is represented by $A \times adjA$?

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2. Can the inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 0 & 4 \end{bmatrix}$ be found?

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Topic 2 Practice Questions 4 Mark Questions

1. If the matrix A is such that $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} A = \begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$ then find A.

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2. Find the inverse of $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

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3. Find the inverse of the matrix $\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

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4. Test whether the following system of equations have non zero solution. Write the solution set.

$2x + 3y + 4z = 0$

$x - 2y - 3z = 0$

$3x + y - 8z = 0$

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5. If a system of equations $\lambda x + 3y = 0$

$x + (\lambda - 2)y = 0$ has infinitely many solutions, then find the values of λ.

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6. Find the adjoint of the following matrix.

$$\begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ -2 & 0 & 1 \end{bmatrix}$$

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7. Test the consistency of the following system of equations

$3x - y = 5 \text{ and } 6x - 2y = 3$

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Topic 2 Practice Questions 6 Mark Questions

1. Solve by matrix inversion method.

$x - 2y = 3$

$3x + 4y - z = -2$

$5x - 3z = -1$

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2. Solve the following system of equations by the matrix inversion method.

$x + y + z = 4$

$2x - y + 3z = 1$

and $3x + 2y - z = 1$

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3. Solve the matrix inversion method

$x + 2y + 3z = 8, 2x + y + z = 8 \text{ and } x + y + 2z = 6$

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4. Solve by matrix inversion method.

$x + y + z = 2$

$2x + y + z = 4$

$x + y - z = 1$

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5. Solve the following system of equations by the matrix inversion method.

$x - y + z = 4$

$2x + y - 3z = 0$

$x + y + z = 2$

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6. Solve the following system of equations by matrix inversion method, where $x \neq 0, y \neq 0$ and $z \neq 0$

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Topic Test 2

1. If $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ verify that A. (adjA) =(adj A).A=$|A|. I$

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2. Find the inverse of the matrix $A = \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$

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3. Find the matrix A satisfying the equation

$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}. A. \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

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4. Find the adjoint of the matrix $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and hence show that A (adj A)=$|A|I$

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5. Using matrix method solve the following system of linear equations

$5x + y - 7 = 0$

$4x - 2y - 3z = 5$

$7x + 2y + 2z = 7$

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6. Solve the following by matrix inversin method.

$x - 2y = 3$

$3x + 4y - z = -2$

$5x - 3z = -1$

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7. Suppose $A = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ Then

find BA and use this to solve the syetm of equations

$y + 2x = 7$

$x - y = 3$

$2x + 3y + 4z = 17$

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8. If x,y and z are different and

$\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ then show that $1 + xyz = 0$

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Chapter Test 1 Mark Questions

1. If $\begin{vmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{vmatrix}$ then A^{-1} exist for which value of λ?

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2. Evaluate the following determinants. $\begin{bmatrix} 2 & 3 & 1 \\ 0 & 0 & 0 \\ -1 & 2 & 0 \end{bmatrix}$

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3. Can the inverse of the matrices $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$ be found?

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4. Find the area of the triangle, whose vertices are (-2,-3) , (3,2) and (-1,-8)

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5. Evaulate $\begin{vmatrix} \cos 15^\circ, \sin 15^\circ \\ \sin 75^\circ, \cos 75^\circ \end{vmatrix}$

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6. Evaluate consistency and solvability by matrix method.

$x + y + z = 4$

$2x + 5y - 2z = 3$

$x + 7y - 7z = 5$

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Chapter Test 4 Mark Questions

1. Prove the following : $\begin{bmatrix} \sin\alpha & \cos\alpha & \cos(\alpha+\delta) \\ \sin\beta & \cos\beta & \cos(\beta+\delta) \\ \sin\alpha & \cos\gamma & \cos(\gamma+\delta) \end{bmatrix}$ =0

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2. Solve $\begin{bmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{bmatrix} = 0$

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3. Find the adjoint of the following matrix.

$$\begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ -2 & 0 & 1 \end{bmatrix}$$

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4. If $A(x_1, y_1), B(x_2, y_2)$, and, $C(x_3, y_3)$ are vertices of an equilateral triangle whose each side is equal to a, then prove that

$$\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}^2 = 3a^4.$$

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5. Given $A = \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$ compute A^{-1} and show that $2A^{-1} = 9I - A$

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6. Eliminate x,y,z from

a=x/y-z, b=y/z-x, c=z/x-y

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7. If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ then show that $A^{-1} = A^2$

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Chapter Test 6 Mark Questions

1. Suppose $A = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ then find BA and use these to solve the system of equations

$y + 2x = 7$

$x - y = 3$

$2x + 3y + 4z = 17$

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2. If $f_r(x), g_r(x), h_r(x) r = 1, 2, 3$ are polynomials in x. Such that $f_r(a) = g_r(a) = h_r(a)$ and $F(x) = \begin{vmatrix} f_1(x) & f_2(x) & f_3(x) \\ g_1(x) & g_2(x) & g_3(x) \\ h_1(x) & h_2(x) & h_3(x) \end{vmatrix}$ Find F.

(x) at x=a

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3. If $A = \begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$ then find A^{-1} Using A^{-1} solve the system of linear equations

$x - 2y = 10$

$2x - y - z = 8$

$-2y + z = 7$

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4. Using matrix method solve the following system of equations

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4$$
$$\frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1$$
$$\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$$

where x,y and $z \neq 0$

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