$$\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix} = \to (a+ib)(a-ib) - (c+id)(-c+id)$$

$$\to \left[a^2 - (ib)^2\right] - \left[(id)^2 - (c)^2\right]$$

(a) $(a+b)^2$

(b) $(a+b+c+d)^2$ $\to$ $a^2 + b^2 - \left[-d^2 - c^2\right]$

(c) $(a^2 + b^2 - c^2 - d^2)$

$a^2 + b^2 + d^2 + c^2$

(d) $a^2 + b^2 + c^2 + d^2$

$$\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix} =$$ $\cos 15 \cos 75 - \sin 15 \sin 75$

(a) 0

(b) 5

(c) 3

(d) 7

$\cos(15+75)$

$\cos(90) = 0$

$\boxed{\cos A \cos B - \sin A \sin B}$

$\cos(A+B)$

ABLES® KOTA

Consider the system of linear equations;

$x_1 + 2x_2 + x_3 = 3$

$2x_1 + 3x_2 + x_3 = 3$

$3x_1 + 5x_2 + 2x_3 = 1$

The system has

(a) exactly 3 solutions

(b) a unique solution

(c) no solution

(d) infinite number of solutions

inverse → unique

unique

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

$|A| = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 3 & 5 & 2 \end{vmatrix}$

$|A| = 1(6-5) - 2(4-3) + 1(10-9)$

$= 1 - 2 + 1 = 0$

A → singular

A^{-1} → exist

$x_1 \to 3$, $x_2 \to 3$, $x_3 \to 3$

$\boxed{|A| \neq 0}$

$\mathrm{adj}(A) B = 0$

$\neq 0$

$AX = B$

$\boxed{X = A^{-1}B}$

$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

For any 2 × 2 matrix A, if A (adj. A) = $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A|$ is equal to :

(a) 0

(b) 10

(c) 20

(d) 100

$|A| = ?$

$\Rightarrow A\cdot(\text{adj } A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix} = 10\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow A(\text{adj } A) = 10\cdot I$ — (1)

$\Rightarrow \because A^{-1} = \frac{1}{|A|}\text{adj}(A)$

$\Rightarrow \text{adj}(A) = A^{-1}\cdot|A|$ — (2)

$A\cdot A^{-1}|A| = 10\cdot I$

$\Rightarrow \cancel{I}\cdot|A| = 10\cdot\cancel{I}$

$\Rightarrow \boxed{|A| = 10}$

If matrix $A = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{bmatrix}$ and $A^{-1} = \frac{1}{k}$ (adj A), then k is :

(a) 7 (b) – 7

(c) 15 (d) – 11

$\because A^{-1} = \frac{1}{|A|} \cdot adj(A)$

give

Sol^n: $\boxed{A^{-1} = \frac{1}{k}(adj\ A)}$ So: $\boxed{|A| = k}$

$|A| = \begin{vmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{vmatrix} =$

$= -1(-3-4)+1(6+2) = 7+8$

If I_3 is the identity matrix of order 3, then I_3^{-1} is

(a) 0 (b) $3 I_3$

(c) I_3 (d) Does not exist

$A^{-1} = \frac{1}{|A|} \cdot adj(A)$

$A^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

$I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \to I_2$

$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

inverse → same → I_3

$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $|I| = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 1$

$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$I_3 \to$ inverse $\to I_3$

$\Rightarrow adj(I) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

If rows and columns of the determinant are interchanged, then its value

(a) remains unchanged

(b) becomes change

(c) is doubled

(d) is zero

$$\begin{vmatrix} 1 & 2 & 3 \\ 5 & 6 & 7 \\ 1 & 5 & 9 \end{vmatrix} \Rightarrow$$

$$\begin{vmatrix} 1 & 5 & 1 \\ 2 & 6 & 5 \\ 3 & 7 & 9 \end{vmatrix} = \text{Same}$$

If $[1\ x\ 1]\begin{bmatrix}1 & 3 & 2\\ 0 & 5 & 1\\ 0 & 3 & 2\end{bmatrix}\begin{bmatrix}x\\ 1\\ -2\end{bmatrix}=0$, then x is

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$

(c) 1 (d) -1

$(a+ib)(a-ib)-(c+id)(-c+id)$

$\rightarrow [a^2-(ib)^2]-[(id)^2-(c)^2]$

$\rightarrow a^2+b^2-[-d^2-c^2]$

$a^2+b^2+d^2+c^2$

A square matrix $A = [a_{ij}]_{n \times n}$ is called a diagonal matrix if $a_{ij} = 0$ for

(a) $i = j$

(b) $i < j$

(c) $i > j$

(d) $i \neq j$

$\cos 15 \cos 75 - \sin 15 \sin 75$

$\cos(15+75)$

$\cos(90) = 0$

$\boxed{\cos A \cos B - \sin A \sin B}$

$\cos(A+B)$

If $P = \begin{bmatrix} i & 0 & -i \\ 0 & -i & i \\ -i & i & 0 \end{bmatrix}$ and $Q = \begin{bmatrix} -i & i \\ 0 & 0 \\ i & -i \end{bmatrix}$, then PQ is equal to

(a) $\begin{bmatrix} -2 & 2 \\ 1 & -1 \\ 1 & -1 \end{bmatrix}$

(b) $\begin{bmatrix} 2 & -2 \\ -1 & 1 \\ -1 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & -2 \\ -1 & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

inverse → unique

unique

$\boxed{|A| \neq 0}$

$(\text{adj } A)B = 0$

$\neq 0$

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

$AX = B$

$\boxed{X = A^{-1}B}$

$|A| = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 3 & 5 & 2 \end{vmatrix}$

A → singular

A^{-1} → exist

$|A| = 1(6-5) - 2(4-3) + 1(10-9)$

$= 1 - 2 + 1 = 0$

$x_1 \to 6$, $x_2 \to 6$, $x_3 \to 3$

$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

If a matrix A is both symmetric and skew-symmetric, then

(a) A is a diagonal matrix

(b) A is zero matrix

(c) A is a scalar matrix

(d) A is square matrix

$|A| = ?$

$\boxed{A \cdot A^{-1}} \cdot |A| = 10 \cdot I$

$\Rightarrow \cancel{I} \cdot |A| = 10 \cancel{I}$

$\Rightarrow \boxed{|A| = 10}$

$\Rightarrow A \cdot (\text{adj } A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix} = 10 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow \boxed{A (\text{adj } A) = 10 \cdot I}$ — (1)

$\Rightarrow \because \boxed{A^{-1} = \frac{1}{|A|} \text{adj}(A)}$

$\Rightarrow \text{adj}(A) = A^{-1} \cdot |A|$ — (2)

If A is a square matrix such that $A^2 = A$,

then $(I + A)^3 - 7A$ is equal to

(a) A (b) $I - A$

(c) I (d) 3 A

$\because A^{-1} = \frac{1}{|A|} \cdot \mathrm{adj}(A)$

give

Sol^n: $\boxed{A^{-1} = \frac{1}{K}(\mathrm{adj}\ A)}$ So: $\boxed{|A| = K}$

$$|A| = \begin{vmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{vmatrix} =$$

$= -1(3-4) + 1(6+2) = 7 + 8$

The matrix $\begin{bmatrix} 2 & 5 & -7 \\ 0 & 3 & 11 \\ 0 & 0 & 9 \end{bmatrix}$ is:

(a) symmetric
(b) diagonal
(c) upper triangular
(d) skew symmetric

$A^{-1} = \frac{1}{|A|} \cdot \text{adj}(A)$

$A^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

$I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \rightarrow I_2$

$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

inverse → same → I_3

$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad |I| = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 1$

$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$I_3 \rightarrow$ inverse $\rightarrow I_3 \Rightarrow \text{adj}(I) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

If matrix $A = [a_{ij}]_{2\times 2}$, where $a_{ij} = \begin{cases} 1 & \text{if} \quad i \neq j \\ 0 & \text{if} \quad i = j \end{cases}$, then A^2 is equal to

(a) I

(b) A

(c) O

(d) ~~None of these~~

$$\begin{vmatrix} 1 & 2 & 3 \\ 5 & 6 & 7 \\ 1 & 5 & 9 \end{vmatrix} \Rightarrow$$

$$\begin{vmatrix} 1 & 5 & 1 \\ 2 & 6 & 5 \\ 3 & 7 & 9 \end{vmatrix} = \text{Same}$$

Let A = {1, 2, 3, 4}, B = {1, 5, 9, 11, 15, 16}

and f = {(1, 5), (2, 9), (3, 1), (4, 5), (2, 11)}.

Then,

(a) f is a relation from A to B

(b) f is a function from A to B

(c) Both (a) and (b)

(d) None of these

$(a+ib)(a-ib)-(c+id)(-c+id)$

$\rightarrow [a^2-(ib)^2]-[(id)^2-(c)^2]$

$\rightarrow a^2+b^2-[-d^2-c^2]$

$a^2+b^2+d^2+c^2$

Let $n(A) = m$, and $n(B) = n$. Then the total number of non-empty relations that can be defined from A to B is

(a) m^n

(b) $n^m - 1$

(c) $mn - 1$

(d) $2^{mn} - 1$

$\cos 15 \cos 75 - \sin 15 \sin 75$

$\cos(15+75)$

$\cos(90) = 0$

$\cos A \cos B - \sin A \sin B$

$\cos(A+B)$

The relation R defined on the set A = {1, 2, 3, 4, 5} by R = {(x, y) : $|x^2 - y^2| <$ 16} is given by

inverse → unique

unique

(a) {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)}

(b) {(2, 2), (3, 2), (4, 2), (2, 4)}

(c) {(3, 3), (4, 3), (5, 4), (3, 4)}

(d) None of these

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

$|A| \neq 0$

$\det(A) B = 0$

$\neq 0$

$AX = B$

$\boxed{X = A^{-1}B}$

$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

$|A| = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 3 & 5 & 2 \end{vmatrix}$

A → singular

A^{-1} → exist

$|A| = 1(6-5) - 2(4-3) + 1(10-9)$

$= 1 - 2 + 1 = 0$

$x_1 \to 3$

$x_2 \to 3$

$x_3 \to 3$

If A = {8, 9, 10} and B = {1, 2, 3, 4, 5}, then the number of elements in A × A × B are

$|A| = ?$

$\boxed{A \cdot A^{-1}} \, |A| = 10 \cdot I$

$\Rightarrow I \cdot |A| = 10 \cdot I$

$\Rightarrow \boxed{|A| = 10}$

$\Rightarrow A \cdot (\text{adj } A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix} = 10 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow A (\text{adj } A) = 10 \cdot I$ — (1)

$\because A^{-1} = \frac{1}{|A|} \text{adj}(A)$

$\Rightarrow \text{adj}(A) = A^{-1} \cdot |A|$ — (2)

(a) 15 (b) 30

(c) 45 (d) 75

If n (X) = 5 and n (Y) = 7, then the number of relations on X × Y is 2^{5m}. The value of 'm' is

(a) 5 (b) 7

(c) 6 (d) 8

$\because A^{-1} = \frac{1}{|A|} \cdot adj(A)$

give

Sol^n: $\boxed{A^{-1} = \frac{1}{K}(adj\, A)}$ So: $\boxed{|A| = K}$

$$|A| = \begin{vmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{vmatrix} =$$

$= -1(-3-4) + 1(6+2) = 7 + 8$

Let N be the set of natural numbers and the relation R be defined such that {R = (x, y) : y = 2x, x, y ∈ N}. Then,

(a) R is a function

(b) R is not a function

(c) domain, range and co-domain is N

(d) None of the above

$I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \to I_2$

$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

inverse → same → I_3

$I_3 \to$ inverse $\to I_3$

$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \Rightarrow |I| = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 1$

$\Rightarrow \text{adj}(I) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

$A^{-1} = \frac{1}{|A|}\text{adj}(A)$