CHAPTER 3

Matrices

TRY YOURSELF ANSWERS

1. (i) Since, in the given matrix, the number of rows is 3 and number of columns is 4.
Thus, order of matrix A is 3×4.
(ii) Since, order of matrix A is 3×4. Thus, number of elements in matrix A is $3 \times 4 = 12$.
(iii) $a_{12} = 6$, $a_{22} = -7$, $a_{31} = 1$, $a_{32} = \sqrt{7}$ and $a_{24} = 5$.

2. (i) We have, $A = [a_{ij}]_{3\times 4}$, where $a_{ij} = \frac{i-j}{i+j}$

$$\therefore \quad a_{11} = \frac{1-1}{1+1} = 0; a_{12} = \frac{1-2}{1+2} = \frac{-1}{3}; a_{13} = \frac{1-3}{1+3} = \frac{-1}{2};$$

$$a_{14} = \frac{1-4}{1+4} = \frac{-3}{5}; a_{21} = \frac{2-1}{2+1} = \frac{1}{3}; a_{22} = \frac{2-2}{2+2} = 0;$$

$$a_{23} = \frac{2-3}{2+3} = \frac{-1}{5}; a_{24} = \frac{2-4}{2+4} = \frac{-1}{3}; a_{31} = \frac{3-1}{3+1} = \frac{1}{2};$$

$$a_{32} = \frac{3-2}{3+2} = \frac{1}{5}; a_{33} = \frac{3-3}{3+3} = 0; a_{34} = \frac{3-4}{3+4} = \frac{-1}{7};$$

$\therefore$ Required matrix is given by

$$A = \begin{bmatrix} 0 & \frac{-1}{3} & \frac{-1}{2} & \frac{-3}{5} \\ \frac{1}{3} & 0 & \frac{-1}{5} & \frac{-1}{3} \\ \frac{1}{2} & \frac{1}{5} & 0 & \frac{-1}{7} \end{bmatrix}$$

(ii) We have, $A = [a_{ij}]_{3\times 4}$, where $a_{ij} = i \cdot j$

$\therefore$ $a_{11} = 1\cdot 1 = 1$; $a_{12} = 1\cdot 2 = 2$; $a_{13} = 1\cdot 3 = 3$; $a_{14} = 1\cdot 4 = 4$
$a_{21} = 2\cdot 1 = 2$; $a_{22} = 2\cdot 2 = 4$; $a_{23} = 2\cdot 3 = 6$; $a_{24} = 2\cdot 4 = 8$
$a_{31} = 3\cdot 1 = 3$; $a_{32} = 3\cdot 2 = 6$; $a_{33} = 3\cdot 3 = 9$; $a_{34} = 3\cdot 4 = 12$

$\therefore$ Required matrix is given by

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 3 & 6 & 9 & 12 \end{bmatrix}$$

3. Given, number of elements = 16
All factors of 16 are ; 1, 2, 4, 8 and 16.
Possible ordered pairs whose product is 16 are (1, 16), (2, 8), (4, 4), (8, 2), and (16, 1).
Hence, possible orders of the matrix are
1×16, 2×8, 4×4, 8×2 and 16×1.

4. (i) The matrix $A = [12]_{1\times 1}$ is a row as well as column matrix as it contains only one row and only one column.

(ii) The matrix $A = \begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}_{3\times 3}$ is a scalar matrix, which is not a unit matrix as its diagonal elements are not equal to 1.

(iii) The matrix $A = \begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix}_{2\times 2}$ is a diagonal matrix, which is not a scalar matrix as its diagonal elements are not equal.

(iv) The matrix $A = \begin{bmatrix} 2 & 0 \\ 0 & -3 \end{bmatrix}_{2\times 2}$ is a lower as well as an upper triangular matrix, as $a_{ij} = 0$ for $i < j$ and also for $i > j$.

(v) The matrix $A = \begin{bmatrix} 0 & 0 & 2 \\ 0 & 1 & 0 \\ 2 & 0 & 0 \end{bmatrix}_{3\times 3}$ is a square matrix, which is not a diagonal matrix as a_{13} and a_{31} are non-zero.

5. We have, $\begin{bmatrix} 2x+3y & a+b & 8 \\ 1 & 4x+y & 3a-4b \end{bmatrix} = \begin{bmatrix} 7 & 1 & 8 \\ 1 & 9 & 10 \end{bmatrix}$

By definition of equal matrices, we have
$2x + 3y = 7$ ... (i)
$a + b = 1$ ... (ii)
$4x + y = 9$ ... (iii)
$3a - 4b = 10$ ... (iv)
Solving (i) and (iii), we get
$x = 2, y = 1$
Solving (ii) and (iv), we get
$a = 2, b = -1$

6. We have,

$$A = \begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix} \text{ and } C = \begin{bmatrix} -3 & 2 \\ -7 & 5 \end{bmatrix}$$

(i) $2A + B = 2\begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix}$

$$= \begin{bmatrix} 10 & 6 \\ 8 & 4 \end{bmatrix} + \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 10+1 & 6+1 \\ 8+(-1) & 4+2 \end{bmatrix} = \begin{bmatrix} 11 & 7 \\ 7 & 6 \end{bmatrix}$$

(ii) $B - C = \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix} - \begin{bmatrix} -3 & 2 \\ -7 & 5 \end{bmatrix}$

$$= \begin{bmatrix} 1-(-3) & 1-2 \\ -1-(-7) & 2-5 \end{bmatrix} = \begin{bmatrix} 1+3 & 1-2 \\ -1+7 & 2-5 \end{bmatrix} = \begin{bmatrix} 4 & -1 \\ 6 & -3 \end{bmatrix}$$

Now, $3A-(B-C)=3\begin{bmatrix}5&3\\4&2\end{bmatrix}-\begin{bmatrix}4&-1\\6&-3\end{bmatrix}$

$=\begin{bmatrix}15&9\\12&6\end{bmatrix}-\begin{bmatrix}4&-1\\6&-3\end{bmatrix}$

$=\begin{bmatrix}15-4&9+1\\12-6&6+3\end{bmatrix}=\begin{bmatrix}11&10\\6&9\end{bmatrix}$

(iii) $2A+3B-4C=2\begin{bmatrix}5&3\\4&2\end{bmatrix}+3\begin{bmatrix}1&1\\-1&2\end{bmatrix}-4\begin{bmatrix}-3&2\\-7&5\end{bmatrix}$

$=\begin{bmatrix}10&6\\8&4\end{bmatrix}+\begin{bmatrix}3&3\\-3&6\end{bmatrix}-\begin{bmatrix}-12&8\\-28&20\end{bmatrix}$

$=\begin{bmatrix}10+3&6+3\\8-3&4+6\end{bmatrix}-\begin{bmatrix}-12&8\\-28&20\end{bmatrix}$

$=\begin{bmatrix}13+12&9-8\\5+28&10-20\end{bmatrix}=\begin{bmatrix}25&1\\33&-10\end{bmatrix}$

7. We have,

$3\begin{bmatrix}a&b\\c&d\end{bmatrix}=\begin{bmatrix}a&6\\-1&2d\end{bmatrix}+\begin{bmatrix}4&a+b\\c+d&3\end{bmatrix}$

$\Rightarrow \begin{bmatrix}3a&3b\\3c&3d\end{bmatrix}=\begin{bmatrix}a+4&6+a+b\\-1+c+d&2d+3\end{bmatrix}$

By equating the corresponding elements of two matrices, we get

$3a = a + 4 \Rightarrow 2a = 4 \Rightarrow a = 2$

$3b = 6 + a + b \Rightarrow 3b - b = 6 + 2 \Rightarrow 2b = 8 \Rightarrow b = 4$

$3c = -1 + c + d \Rightarrow 2c = -1 + d$ ... (i)

$3d = 2d + 3 \Rightarrow d = 3$

From (i), $2c = -1 + 3 \Rightarrow 2c = 2 \Rightarrow c = 1$

$\therefore$ $a = 2, b = 4, c = 1, d = 3.$

8. Since, $3A + 5B + 2C = O$

$\Rightarrow 3\begin{bmatrix}7&8\\1&9\end{bmatrix}+5\begin{bmatrix}7&12\\5&1\end{bmatrix}+2C=\begin{bmatrix}0&0\\0&0\end{bmatrix}$

$\Rightarrow \begin{bmatrix}21&24\\3&27\end{bmatrix}+\begin{bmatrix}35&60\\25&5\end{bmatrix}+2C=\begin{bmatrix}0&0\\0&0\end{bmatrix}$

$\Rightarrow \begin{bmatrix}21+35&24+60\\3+25&27+5\end{bmatrix}+2C=\begin{bmatrix}0&0\\0&0\end{bmatrix}$

$\Rightarrow 2C=\begin{bmatrix}0&0\\0&0\end{bmatrix}-\begin{bmatrix}56&84\\28&32\end{bmatrix}$

$\Rightarrow 2C=\begin{bmatrix}-56&-84\\-28&-32\end{bmatrix}$

$\Rightarrow C=\frac{1}{2}\begin{bmatrix}-56&-84\\-28&-32\end{bmatrix}=\begin{bmatrix}-28&-42\\-14&-16\end{bmatrix}$

9. $aI + bE = a\begin{bmatrix}1&0\\0&1\end{bmatrix}+b\begin{bmatrix}0&1\\0&0\end{bmatrix}$

$=\begin{bmatrix}a&b\\0&a\end{bmatrix}$

$\therefore$ $(aI+bE)^2=\begin{bmatrix}a&b\\0&a\end{bmatrix}\begin{bmatrix}a&b\\0&a\end{bmatrix}$

$=\begin{bmatrix}a^2+0&ab+ba\\0+0&0+a^2\end{bmatrix}=\begin{bmatrix}a^2&2ab\\0&a^2\end{bmatrix}$

$(aI + bE)^3 = (aI + bE)(aI + bE)^2$

$=\begin{bmatrix}a&b\\0&a\end{bmatrix}\begin{bmatrix}a^2&2ab\\0&a^2\end{bmatrix}$

$=\begin{bmatrix}a^3+0&2a^2b+ba^2\\0+0&0+a^3\end{bmatrix}=\begin{bmatrix}a^3&3a^2b\\0&a^3\end{bmatrix}$ ... (i)

Also, $a^3I+3a^2bE=a^3\begin{bmatrix}1&0\\0&1\end{bmatrix}+3a^2b\begin{bmatrix}0&1\\0&0\end{bmatrix}$

$=\begin{bmatrix}a^3&3a^2b\\0&a^3\end{bmatrix}$ ... (ii)

From (i) and (ii), we get

$(aI+ bE)^3 = a^3I + 3a^2bE$

10. Given, $\begin{bmatrix}2x&3\end{bmatrix}\begin{bmatrix}1&2\\-3&0\end{bmatrix}\begin{bmatrix}x\\8\end{bmatrix}=O$

$\Rightarrow \begin{bmatrix}2x&3\end{bmatrix}\begin{bmatrix}x+16\\-3x+0\end{bmatrix}=O\Rightarrow\begin{bmatrix}2x&3\end{bmatrix}\begin{bmatrix}x+16\\-3x\end{bmatrix}=O$

$\Rightarrow [2x(x + 16) + 3(-3x)]_{1\times1} = [0]_{1\times1}$

$\Rightarrow 2x^2 + 32x - 9x = 0$

$\Rightarrow x(2x + 23) = 0 \Rightarrow x = 0 \text{ or } 2x + 23 = 0$

$\Rightarrow x=0 \text{ or } x=\frac{-23}{2}.$

11. Given, $A=\begin{bmatrix}1&1&1\\0&1&1\\0&0&1\end{bmatrix}$

We have to prove that $A^n=\begin{bmatrix}1&n&\frac{n(n+1)}{2}\\0&1&n\\0&0&1\end{bmatrix}, \forall n\in N$

For $n=1, A^1=\begin{bmatrix}1&1&1\\0&1&1\\0&0&1\end{bmatrix}$, which is true.

Let the result is true for a positive integer $n = m$, then

$$A^m = \begin{bmatrix} 1 & m & \frac{m(m+1)}{2} \\ 0 & 1 & m \\ 0 & 0 & 1 \end{bmatrix}$$

$$\text{Now } A^{m+1} = A^m A = \begin{bmatrix} 1 & m & \frac{m(m+1)}{2} \\ 0 & 1 & m \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1+0+0 & 1+m+0 & 1+m+\frac{m(m+1)}{2} \\ 0+0+0 & 0+1+0 & 0+1+m \\ 0+0+0 & 0+0+0 & 0+0+1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & m+1 & \frac{(m+1)(m+2)}{2} \\ 0 & 1 & m+1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\left[\because \quad 1+m+\frac{m(m+1)}{2} = \frac{m^2+3m+2}{2} = \frac{(m+1)(m+2)}{2}\right]$$

$\therefore$ Result is true for $n = m + 1$

Hence, by principle of mathematical induction, result is true for all $n \in N$.

12. $(A + B)^2 = (A + B)(A + B)$

$= A(A + B) + B(A + B)$ [Using distributive property]

$= A^2 + AB + BA + B^2$

Hence, $(A + B)^2 \neq A^2 + 2AB + B^2$ as we can't write $AB = BA$ in general

[$\because$ Matrix multiplication is not always commutative.]

13. We have, $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$

$$\Rightarrow \quad A' = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 2 \\ 0 & 3 & 1 \end{bmatrix} \text{and } B' = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 1 \\ 3 & 3 & 1 \end{bmatrix}$$

(i) $(A + B)' = A' + B'$

$$\Rightarrow \left(\begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}\right)' = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 2 \\ 0 & 3 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 1 \\ 3 & 3 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 1+1 & -1+2 & 0+3 \\ 2+2 & 1+1 & 3+3 \\ 1+0 & 2+1 & 1+1 \end{bmatrix}' = \begin{bmatrix} 1+1 & 2+2 & 1+0 \\ -1+2 & 1+1 & 2+1 \\ 0+3 & 3+3 & 1+1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2 & 1 & 3 \\ 4 & 2 & 6 \\ 1 & 3 & 2 \end{bmatrix}' = \begin{bmatrix} 2 & 4 & 1 \\ 1 & 2 & 3 \\ 3 & 6 & 2 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2 & 4 & 1 \\ 1 & 2 & 3 \\ 3 & 6 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 4 & 1 \\ 1 & 2 & 3 \\ 3 & 6 & 2 \end{bmatrix}, \text{ which is true.}$$

(ii) $(AB)' = B'A'$

$$\Rightarrow \left(\begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}\right)' = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 1 \\ 3 & 3 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 2 \\ 0 & 3 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 1-2+0 & 2-1+0 & 3-3+0 \\ 2+2+0 & 4+1+3 & 6+3+3 \\ 1+4+0 & 2+2+1 & 3+6+1 \end{bmatrix}' = \begin{bmatrix} 1-2+0 & 2+2+0 & 1+4+0 \\ 2-1+0 & 4+1+3 & 2+2+1 \\ 3-3+0 & 6+3+3 & 3+6+1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} -1 & 1 & 0 \\ 4 & 8 & 12 \\ 5 & 5 & 10 \end{bmatrix}' = \begin{bmatrix} -1 & 4 & 5 \\ 1 & 8 & 5 \\ 0 & 12 & 10 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} -1 & 4 & 5 \\ 1 & 8 & 5 \\ 0 & 12 & 10 \end{bmatrix} = \begin{bmatrix} -1 & 4 & 5 \\ 1 & 8 & 5 \\ 0 & 12 & 10 \end{bmatrix}, \text{ which is true.}$$

(iii) $(2A)' = 2A'$

$$\Rightarrow \left(2\begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}\right)' = 2\begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}'$$

$$\Rightarrow \begin{bmatrix} 2 & -2 & 0 \\ 4 & 2 & 6 \\ 2 & 4 & 2 \end{bmatrix}' = 2\begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 2 \\ 0 & 3 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2 & 4 & 2 \\ -2 & 2 & 4 \\ 0 & 6 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 4 & 2 \\ -2 & 2 & 4 \\ 0 & 6 & 2 \end{bmatrix}, \text{ which is true.}$$

14. We have, $A = \begin{bmatrix} -1 & 5 \\ 3 & 7 \end{bmatrix} \Rightarrow A' = \begin{bmatrix} -1 & 3 \\ 5 & 7 \end{bmatrix}$.

(i) Let $P = A + A' = \begin{bmatrix} -1 & 5 \\ 3 & 7 \end{bmatrix} + \begin{bmatrix} -1 & 3 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} -2 & 8 \\ 8 & 14 \end{bmatrix}$

$\Rightarrow \quad P' = \begin{bmatrix} -2 & 8 \\ 8 & 14 \end{bmatrix}' = \begin{bmatrix} -2 & 8 \\ 8 & 14 \end{bmatrix} = P$

$\Rightarrow$ P is symmetric. $\therefore$ $A + A'$ is a symmetric matrix.

(ii) Let $Q = A - A' = \begin{bmatrix} -1 & 5 \\ 3 & 7 \end{bmatrix} - \begin{bmatrix} -1 & 3 \\ 5 & 7 \end{bmatrix}$

$= \begin{bmatrix} -1+1 & 5-3 \\ 3-5 & 7-7 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$

$\Rightarrow \quad Q' = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}' = \begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix} = -\begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix} = -Q$

$\therefore$ Q is skew - symmetric.

Hence, $A - A'$ is a skew-symmetric matrix.

15. Let $A = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix} \Rightarrow A' = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$

$\therefore \quad A + A' = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix} + \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$

$= \begin{bmatrix} 6 & 1 & -5 \\ 1 & -4 & -4 \\ -5 & -4 & 4 \end{bmatrix}$

$\Rightarrow \quad \frac{1}{2}(A + A') = \frac{1}{2}\begin{bmatrix} 6 & 1 & -5 \\ 1 & -4 & -4 \\ -5 & -4 & 4 \end{bmatrix} = \begin{bmatrix} 3 & \frac{1}{2} & \frac{-5}{2} \\ \frac{1}{2} & -2 & -2 \\ \frac{-5}{2} & -2 & 2 \end{bmatrix},$

which is clearly a symmetric matrix.

Now, $A - A' = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix} - \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$

$= \begin{bmatrix} 0 & -5 & -3 \\ 5 & 0 & -6 \\ 3 & 6 & 0 \end{bmatrix}$

$\Rightarrow \quad \frac{1}{2}(A - A') = \frac{1}{2}\begin{bmatrix} 0 & -5 & -3 \\ 5 & 0 & -6 \\ 3 & 6 & 0 \end{bmatrix} = \begin{bmatrix} 0 & \frac{-5}{2} & \frac{-3}{2} \\ \frac{5}{2} & 0 & -3 \\ \frac{3}{2} & 3 & 0 \end{bmatrix},$

which is clearly a skew - symmetric matrix.

Since, $A = \frac{1}{2}(A + A') + \frac{1}{2}(A - A')$

$\therefore \quad A = \begin{bmatrix} 3 & \frac{1}{2} & \frac{-5}{2} \\ \frac{1}{2} & -2 & -2 \\ \frac{-5}{2} & -2 & 2 \end{bmatrix} + \begin{bmatrix} 0 & \frac{-5}{2} & \frac{-3}{2} \\ \frac{5}{2} & 0 & -3 \\ \frac{3}{2} & 3 & 0 \end{bmatrix}$

Thus, A has been expressed as the sum of a symmetric and a skew - symmetric matrix.

Verification :

$\begin{bmatrix} 3 & \frac{1}{2} & \frac{-5}{2} \\ \frac{1}{2} & -2 & -2 \\ \frac{-5}{2} & -2 & 2 \end{bmatrix} + \begin{bmatrix} 0 & \frac{-5}{2} & \frac{-3}{2} \\ \frac{5}{2} & 0 & -3 \\ \frac{3}{2} & 3 & 0 \end{bmatrix} = \begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix} = A$

16. We have, $A^3 = O$

$\Rightarrow \quad I - A^3 = I - O = I$

$\Rightarrow \quad (I - A)(I + A^2 + AI) = I$

$\Rightarrow \quad (I - A)(I + A + A^2) = I$

So, $(I - A)^{-1} = I + A + A^2$

17. Let $A^{-1} = \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$ and $A = \begin{bmatrix} 4 & -1 \\ -3 & 1 \end{bmatrix}$

Now, $A^{-1}A = I$

$\therefore \quad \text{L.H.S.} = \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 4 & -1 \\ -3 & 1 \end{bmatrix} = \begin{bmatrix} 4-3 & -1+1 \\ 12-12 & -3+4 \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I.$

So, $\begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$ is the inverse of $\begin{bmatrix} 4 & -1 \\ -3 & 1 \end{bmatrix}$.