RD Sharma Solutions Class 12 Maths Chapter 5 Ex 5.1

Algebra of Matrices Ex 5.1 Q1

We know that if a matrix is of the order $m \times n$, it has mn elements. Thus, to find all the possible orders of a matrix having 8 elements, we have to find all the ordered pairs of natural numbers whose products is 8.

The ordered pairs are: $(1 \times 8), (8 \times 1), (2 \times 4), (4 \times 2)$

$(1,5)\ and\ (5,1)$ are the ordered pairs of natural numbers whose product is 5.

Hence, the possible orders of a matrix having 5 elements are $1 \times 5\ and\ 5 \times 1$

Algebra of Matrices Ex 5.1 Q2

If $A = [a_{ij}] = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 4 & 9 \\ 0 & 7 & -2 \end{bmatrix}$ and $B = [b_{ij}] = \begin{bmatrix} 2 & -1 \\ -3 & 4 \\ 1 & 2 \end{bmatrix}$

(i) $a_{22} + b_{21} = 4 + (-3) = 1$

Hence, $a_{22} + b_{21} = 1$

(ii) $a_{11}\, b_{11} + a_{22}b_{22} = (2)(2) + (4)(4) = 4 + 16 = 20$

Hence,

$$a_{11}\, b_{11} + a_{22}b_{22} = 20$$

Algebra of Matrices Ex 5.1 Q3

Here, $A = [a_{ij}]_{3\times 4}$

$R_1 = \text{first row of } A = [a_{11} a_{12} a_{13} a_{14}]_{1\times 4}$

So, order of $R_1 = 1 \times 4$

$C_2 = \text{Second column of } A$

$$= \begin{bmatrix} a_{12} \\ a_{22} \\ a_{32} \end{bmatrix}_{3\times 1}$$

Order of $C_2 = 3 \times 1$

Algebra of Matrices Ex 5.1 Q4

Let $A = (a_{ij})_{2\times 3}$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix} \qquad ---(i)$$

(i) $a_{ij} = i.j$

$a_{11} = 1.1 = 1,\ a_{12} = 1.2 = 2,\ a_{13} = 1.3 = 3$

$a_{21} = 2.1 = 2,\ a_{22} = 2.2 = 4,\ a_{23} = 2.3 = 6$

So, using equation (i)

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

(ii) $a_{ij} = 2i - j$

$a_{11} = 2(1) - 1 = 1,\ a_{12} = 2(1) - 2 = 0,\ a_{13} = 2(1) - 3 = -1$

$a_{21} = 2(2) - 1 = 3,\ a_{22} = 2(2) - 2 = 2,\ a_{23} = 2(2) - 3 = 1$

Using equation (i)

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

(iii) $a_{ij} = i + j$

$a_{11} = 1 + 1 = 2,\ a_{12} = 1 + 2 = 3,\ a_{13} = 1 + 3 = 4$

$a_{21} = 2 + 1 = 3,\ a_{22} = 2 + 2 = 4,\ a_{23} = 2 + 3 = 5$

Using equation (i)

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$$

(iv) $a_{ij} = \frac{(i + j)^2}{2}$

$a_{11} = \frac{(1+1)^2}{2} = 2,\ a_{12} = \frac{(1+2)^2}{2} = \frac{9}{2},\ a_{13} = \frac{(1+3)^2}{2} = 8$

$a_{21} = \frac{(2+1)^2}{2} = \frac{9}{2},\ a_{22} = \frac{(2+2)^2}{2} = 8,\ a_{23} = \frac{(2+3)^2}{2} = \frac{25}{2}$

Using equation(i),

$$A = \begin{bmatrix} 2 & \frac{9}{2} & 8 \\ \frac{9}{2} & 8 & \frac{25}{2} \end{bmatrix}$$

Algebra of Matrices Ex 5.1 Q5

Here,

$$A = [a_{ij}]_{2\times 2} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad \text{---(i)}$$

(i) $a_{ij} = \frac{(i + j)^2}{2}$

$a_{11} = \frac{(1+1)^2}{2} = 2,\ a_{12} = \frac{(1+2)^2}{2} = \frac{9}{2},$

$a_{21} = \frac{(2+1)^2}{2} = \frac{9}{2},\ a_{22} = \frac{(2+2)^2}{2} = 8,$

Using equation (i)

$$A = \begin{bmatrix} 2 & \frac{9}{2} \\ \frac{9}{2} & 8 \end{bmatrix}$$

(ii) $a_{ij} = \frac{(i - j)^2}{2}$

$a_{11} = \frac{(1-1)^2}{2} = 0,\ a_{12} = \frac{(1+2)^2}{2} = \frac{1}{2},$

$a_{21} = \frac{(2-1)^2}{2} = \frac{1}{2},\ a_{22} = \frac{(2-2)^2}{2} = 0,$

Using equation (i)

$$A = \begin{bmatrix} 0 & \frac{1}{2} \\ \frac{1}{2} & 0 \end{bmatrix}$$

(iii) $a_{ij} = \frac{(i-2j)^2}{2}$

$a_{11} = \frac{\left(1-2(1)\right)^2}{2} = \frac{1}{2}$, $a_{12} = \frac{\left(1-2(2)\right)^2}{2} = \frac{9}{2}$,

$a_{21} = \frac{\left(2-2(1)\right)^2}{2} = 0$, $a_{22} = \frac{\left(2-2(2)\right)^2}{2} = 2$,

Using equation (i)

$$A = \begin{bmatrix} \frac{1}{2} & \frac{9}{2} \\ 0 & 2 \end{bmatrix}$$

(iv) $a_{ij} = \frac{(2i+j)^2}{2}$

$a_{11} = \frac{\left(2(1)+1\right)^2}{2} = \frac{9}{2}$, $a_{12} = \frac{\left(1(1)+2\right)^2}{2} = 8$,

$a_{21} = \frac{\left(2(2)+2\right)^2}{2} = \frac{25}{2}$, $a_{22} = \frac{\left(2(2)+2\right)^2}{2} = 18$

Using equation (i)

$$A = \begin{bmatrix} \frac{9}{2} & 8 \\ \frac{25}{2} & 18 \end{bmatrix}$$

(v) $a_{ij} = \frac{\left(|2i-3j|\right)^2}{2}$

$a_{11} = \frac{|2(1)-3(1)|}{2} = \frac{1}{2}$, $a_{12} = \frac{|2(1)-3(2)|}{2} = 2$

$a_{21} = \frac{|2(2)-3(1)|}{2} = \frac{1}{2}$, $a_{22} = \frac{|2(2)-3(2)|}{2} = 1$

Using equation (i)

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

Algebra of Matrices Ex 5.1 Q6

Here, $A = (a_{ij})_{3\times 4} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{bmatrix} \quad ---(i)$

(i) $a_{ij} = i + j$

$a_{11} = 1+1 = 2,\ a_{12} = 1+2 = 3,\ a_{13} = 1+3 = 4,\ a_{14} = 1+4 = 5$

$a_{21} = 2+1 = 3,\ a_{22} = 2+2 = 4,\ a_{23} = 2+3 = 5,\ a_{24} = 2+4 = 6$

$a_{31} = 3+1 = 4,\ a_{32} = 3+2 = 5,\ a_{33} = 3+3 = 6,\ a_{34} = 3+4 = 7$

Using equation (i)

$$A = \begin{bmatrix} 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \end{bmatrix}$$

(ii) $a_{ij} = i - j$

$a_{11} = 1-1 = 0,\ a_{12} = 1-2 = -1,\ a_{13} = 1-3 = -2,\ a_{14} = 1-4 = -3$

$a_{21} = 2-1 = 1,\ a_{22} = 2-2 = 0,\ a_{23} = 2-3 = -1,\ a_{24} = 2-4 = -2$

$a_{31} = 3-1 = 2,\ a_{32} = 3-2 = 1,\ a_{33} = 3-3 = 0,\ a_{34} = 3-4 = -1$

Using equation (i)

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

(iii) $a_{ij} = 2i$

$a_{11} = 2(1) = 2,\ a_{12} = 2(1) = 2,\ a_{13} = 2(1) = 2,\ a_{14} = 2(1) = 2$

$a_{21} = 2(2) = 4,\ a_{22} = 2(2) = 4,\ a_{23} = 2(2) = 4,\ a_{24} = 2(2) = 4$

$a_{31} = 2(3) = 6,\ a_{32} = 2(3) = 6,\ a_{33} = 2(3) = 6,\ a_{34} = 2(3) = 6$

Using Equation(i),

$$A = \begin{bmatrix} 2 & 2 & 2 & 2 \\ 4 & 4 & 4 & 4 \\ 6 & 6 & 6 & 6 \end{bmatrix}$$

(iv) $a_{ij} = j$

$a_{11} = 1,\ a_{12} = 2,\ a_{13} = 3,\ a_{14} = 4$

$a_{21} = 1,\ a_{22} = 2,\ a_{13} = 3,\ a_{14} = 4$

$a_{31} = 1,\ a_{32} = 2,\ a_{33} = 3,\ a_{34} = 4$

Using Equation(i),

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{bmatrix}$$

Algebra of Matrices Ex 5.1 Q7

Here,

$$A = [a_{ij}]_{4\times 3} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \\ a_{41} & a_{42} & a_{43} \end{bmatrix}$$

(a) $a_{ij} = 2i + \frac{i}{j}$

$a_{11} = 2(1) + \frac{1}{1} = 3,\ a_{12} = 2(1) + \frac{1}{2} = \frac{5}{2},\ a_{13} = 2(1) + \frac{1}{3} = \frac{7}{3}$

$a_{21} = 2(2) + \frac{2}{1} = 6,\ a_{22} = 2(2) + \frac{2}{2} = 5,\ a_{23} = 2(2) + \frac{2}{3} = \frac{14}{3}$

$a_{31} = 2(3) + \frac{3}{1} = 9,\ a_{32} = 2(3) + \frac{3}{2} = \frac{15}{2},\ a_{33} = 2(3) + \frac{3}{3} = 7$

$a_{41} = 2(4) + \frac{4}{1} = 12,\ a_{42} = 2(4) + \frac{4}{2} = 10,\ a_{43} = 2(4) + \frac{4}{3} = \frac{28}{3}$

Usingequation (i),

$$A = \begin{bmatrix} 3 & \frac{5}{2} & \frac{7}{3} \\ 6 & 5 & \frac{14}{3} \\ 9 & \frac{15}{2} & 7 \\ 12 & 10 & \frac{28}{3} \end{bmatrix}$$

(c) $a_{ij} = i$

$a_{11} = 1,\ a_{12} = 1,\ a_{13} = 1,$

$a_{21} = 2,\ a_{22} = 2,\ a_{23} = 2$

$a_{31} = 3,\ a_{32} = 3,\ a_{33} = 3$

$a_{41} = 4,\ a_{42} = 4,\ a_{43} = 4$

Using equation (i)

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \\ 4 & 4 & 4 \end{bmatrix}$$

Algebra of Matrices Ex 5.1 Q8

Given,

$$\begin{bmatrix} 3x+4y & 2 & x-2y \\ a+b & 2a-b & -1 \end{bmatrix} = \begin{bmatrix} 2 & 2 & 4 \\ 5 & -5 & -1 \end{bmatrix}$$

Since corresponding entries of equal matrix are equal.
So,

$$3x + 4y = 2 \qquad \text{---(i)}$$
$$x - 2y = 4 \qquad \text{---(ii)}$$
$$a + b = 5 \qquad \text{---(iii)}$$
$$2a - b = -5 \qquad \text{---(iv)}$$

Solving equation (i) and (iii)

$$3x - 4y = 2$$
$$\underset{(-)}{3x} \underset{(+)}{- 6y} = \underset{(-)}{12}$$
$$10y = -10$$
$$y = \frac{-10}{10} = -1$$

Put $y = 1$ in equation (ii)

$$x - 2y = 4$$
$$x - 2(-1) = 4$$
$$x = 4 - 2$$
$$x = 2$$

Now, solving equation (iii) *and* (iv),

$$2a + 2b = 10$$
$$\underset{(-)}{2a} \underset{(+)}{- b} = \underset{(+)}{-5}$$
$$3b = 15$$
$$b = \frac{15}{3}$$
$$b = 5$$

Put the value of b in equation of (iii)

$$a + b = 5$$
$$a + 5 = 5$$
$$a = 5 - 5$$
$$a = 0$$

Hence,

$$x = 2, \; y = -1, \; a = 0, \; b = 5$$

Algebra of Matrices Ex 5.1 Q9

Given,

$$\begin{bmatrix} 2x-3y & a-b & 3 \\ 1 & x+4y & 3a+4b \end{bmatrix} = \begin{bmatrix} 1 & -2 & 3 \\ 1 & 6 & 29 \end{bmatrix}$$

Since corresponding entries of equal matrix are equal.
So,

$$2x - 3y = 1 \qquad \text{---(i)}$$
$$x - b = -2 \qquad \text{---(ii)}$$
$$x - 4y = 6 \qquad \text{---(iii)}$$
$$3a + 4b = 29 \qquad \text{---(iv)}$$

Solving equation (i) and (iii)

$$2x - 3y = 1$$
$$\underset{(-)}{2x} - \underset{(-)}{8y} = \underset{(-)}{12}$$
$$-11y = -11$$
$$y = \frac{-11}{-11}$$
$$y = 1$$

Put the value of y in equation (i),

$$2x - 3y = 1$$
$$2x - 3(i) = 1$$
$$2x - 3 = 1$$
$$2x = 1 + 3$$
$$2x = 4$$
$$x = 2$$

Solving equation (ii) and (iv)

$$4a - 4b = -8$$
$$3a - 4b = 29$$
$$7a \quad = 21$$
$$a = \frac{21}{7}$$
$$a = 3$$

Put $a = 3$ in equation (ii),

$$3 - b = -2$$
$$b = 3 + 2$$
$$b = 5$$

Hence,

$$x = 2,\ y = 1,\ a = 3,\ b = 5$$

Algebra of Matrices Ex 5.1 Q10

As the given matrices are equal, therefore their corresponding elements must be equal.

Comparing the corresponding elements, we get

$2a + b = 4 \quad ----(i)$

$a - 2b = -3 \quad ----(ii)$

$5c - d = 11 \quad ----(iii)$

$4c + 3d = 24 \quad ----(iv)$

Multiplying (i) by 2 and adding to (ii)

$5a = 5 \Rightarrow a = 1$

$(i) \Rightarrow b = 4 - 2.1 = 2$

Multiplying (iii)by 3 and adding to (iv)

$19c = 57 \Rightarrow c = 3$

$(iii) \Rightarrow d = 5.3 - 11 = 4$

Hence, $a = 1$, $b = 2$, $c = 3$, $d = 4$

Algebra of Matrices Ex 5.1 Q11

Given,

$$A = B$$

$$\begin{bmatrix} x - 2 & 3 & 2z \\ 18z & y + 2 & 6z \end{bmatrix} = \begin{bmatrix} y & z & 6 \\ 6y & x & 2y \end{bmatrix}$$

Since corresponding entries of equal matrices are equal, So

$x - 2 = y \quad ---(i)$

$3 = z \quad ---(ii)$

$2z = 6 \quad ---(iii)$

$18z = 6 \quad ---(iv)$

$y + 2 = x \quad ---(v)$

$6z = 2y \quad ---(vi)$

Equation (ii) gives, $z = 3$

Put the value of z in equal (iv),

$$18z = 6y$$
$$18(3) = 6y$$
$$54 = 6y$$
$$y = \frac{54}{6}$$
$$y = 9$$

Put $y = 9$ in equation (v)

$$y + 2 = x$$
$$9 + 2 = x$$
$$11 = x$$

Hence,

$$x = 11, y = 9, z = 3$$

Algebra of Matrices Ex 5.1 Q12

Given,

$$\begin{bmatrix} x & 3x-y \\ 2x+z & 3y-w \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$$

Since corresponding entries of equal matrices are equal, So

$$x = 3 \quad \text{---(i)}$$

$$3x - y = 2 \quad \text{---(ii)}$$

$$2x + z = 4 \quad \text{---(iii)}$$

$$3y - w = 7 \quad \text{---(iv)}$$

Put the value of $x = 3$ from equation on (i) in eqation(ii),

$$3x - y = 2$$

$$3(3) - y = 2$$

$$9 - y = 2$$

$$y = 9 - 2$$

$$y = 7$$

Put the value of $y = 7$ in equation (iv),

$$3y - w = 7$$

$$3(7) - w = 7$$

$$w = 21 - 7$$

$$w = 14$$

Put the value of $x = 3$ in equation(iii),

$$2x + z = 4$$

$$2(3) + z = 4$$

$$6 + z = 4$$

$$z = 4 - 6$$

$$z = -2$$

Hence,

$$x = 3, y = 7, z = -2, w = 14$$

Algebra of Matrices Ex 5.1 Q13

Given,

$$\begin{bmatrix} x-y & z \\ 2x-y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$$

Since corresponding entries of equal matrices are equal, So

$$x - y = -1 \qquad ---(i)$$
$$z = 4 \qquad ---(ii)$$
$$2x - y = 0 \qquad ---(iii)$$
$$w = 5 \qquad ---(iv)$$

Solving equation (i) and (iii)

$$x - y = -1$$
$$2x - y = 0$$
$$(-) \quad (+) \quad (-)$$
$$-x = -1$$
$$x = 1$$

Put $x = 1$ in equation (i),

$$x - y = -1$$
$$1 - y = -1$$
$$-y = -1 - 1$$
$$-y = -2$$
$$y = 2$$

equation (ii) and (iv) give the values of z and w respectively, so

$$z = 4, \quad w = 5$$

Hence,

$$x = 1, y = 2, z = 4, w = 5$$

Algebra of Matrices Ex 5.1 Q14

By the definition of equality of matrices we know that if two matrices
$A = [a_{ij}]_{m\times n}$ and $B = [b_{ij}]_{m\times n}$
are equal then $a_{ij} = b_{ij}$ for i = 1,2,3......m and j = 1,2,3.......n.

Given that $\begin{bmatrix} x+3 & z+4 & 2y-7 \\ 4x+6 & a-1 & 0 \\ b-3 & 3b & z+2c \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ 2x & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$

$\therefore$ Equating the entries gives:

$x + 3 = 0, \quad z + 4 = 6$ and $2y - 7 = 3y - 2$

$\Rightarrow \quad x = -3,\ z = 2$ and $2y - 3y = -2 + 7$

$\Rightarrow \quad x = -3,\ z = 2$ and $-y = 5$

$\Rightarrow \quad x = -3,\ z = 2$ and $y = -5$

Similarly, $a - 1 = -3$ and $2c + 2 = 0$

$\Rightarrow \quad a = -3 + 1$ and $2c = -2$

$\Rightarrow \quad a = -2$ and $c = -1$

Lastly, $b - 3 = 2b + 4$

$\Rightarrow \quad b - 2b = 4 + 3$

$\Rightarrow \quad -b = 7$

$\Rightarrow \quad b = -7$

The values of x, y, z, a, b, c are - 3, - 5 , 2 , -2 , - 7 , - 1 respectively.

Algebra of Matrices Ex 5.1 Q15

Given that $\begin{bmatrix} 2x+1 & 5x \\ 0 & y^2+1 \end{bmatrix} = \begin{bmatrix} x+3 & 10 \\ 0 & 26 \end{bmatrix}$

The corresponding entries of the equal matrices are equal.

$\Rightarrow \quad 2x + 1 = x + 3,\ y^2 + 1 = 26,$

$\Rightarrow \quad 2x - x = 2,\ y^2 = 25$

$\Rightarrow \quad x = 2,\ y = \pm 5$

$\Rightarrow \quad x = 2, y = 5$ or $x = 2,\ y = -5$

$\therefore \quad x + y = 7$ or -3

Algebra of Matrices Ex 5.1 Q16

$$\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$$

The corresponding entries of the two equal matrices are equal.

$\Rightarrow$ xy = 8 ......(1),

w = 4 ....(2),

z + 6 = 0 ....(3),

and x + y = 6 ....(4)

from equation (2) and equation(3) we get z = - 6 and w = 4.

from equation(4) we have,

x + y = 6,

$\Rightarrow$ x = 6 - y,

subsituting value of x in equation (1) we get,

$\Rightarrow$ (6 - y)y = 8,

$\Rightarrow$ $y^2 - 6y + 8 = 0$,

$\Rightarrow$ (y - 2) (y - 4)= 0,

$\Rightarrow$ y = 2, 4

subsituting the value of y in equation(1) we get ,

$\Rightarrow$ x = 4, 2

Therefore, value of x , y , z ,w are 2 , 4 , - 6, 4 or 4, 2 , -6 , 4 .

Algebra of Matrices Ex 5.1 Q17

(i) We know that,

Order of a row matrix= $1 \times n$

order of a column matrix= $m \times 1$

So, order of a row as well as column matrix = 1×1

Therefore,

Required matrix = $[a]_{1\times1}$

(ii) A diagonal matrix has only a_{11}, a_{22}, a_{33} for a 3×3 matrix such that a_{11}, a_{22}, a_{33} are equal or different and all other entries zero while scalor matrix has $a_{11} = a_{22} = a_{33} = m$ (say) So, A diagonal matrix which is not scalar must have, $a_{11} \neq a_{22} \neq a_{33}$ and $aij = 0$ for $i \neq j$, So

Required Matrix= $\begin{bmatrix} 4 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

(iii) A triangular matrix is a square matrix $A = [aij]$ such that $aij = 0$ for all $i > j$, so

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

Algebra of Matrices Ex 5.1 Q18

Given data is,

For January 2013:

	Deluxe	Premium	Standard Cars
Dealer A	5	3	4
Dealer B	7	2	3

For January-February :

	Deluxe	Premium	Standard Cars
Dealer A	8	7	6
Dealer B	10	5	7

Hence,

$$A = \begin{array}{c} \\ \text{Dealer A} \\ \text{Dealer B} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Deluxe} & \text{Premum} & \text{Standard} \end{array} \\ \begin{bmatrix} 5 & 3 & 4 \\ 7 & 2 & 3 \end{bmatrix} \end{array}$$

$$B = \begin{array}{c} \\ \text{Dealer A} \\ \text{Dealer B} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Deluxe} & \text{Premum} & \text{Standard} \end{array} \\ \begin{bmatrix} 8 & 7 & 6 \\ 10 & 5 & 7 \end{bmatrix} \end{array}$$

Algebra of Matrices Ex 5.1 Q19

Given,

$$A = B$$

$$\begin{bmatrix} 2x+1 & 2y \\ 0 & y^2 - 5y \end{bmatrix} = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$$

Since equal matrics has all corresponing entries equal,

So,

$$2x + 1 = x + 3 \quad ---(i)$$

$$2y = y^2 + 2 \quad ---(ii)$$

$$y^2 - 5y = -6 \quad ---(iii)$$

Solving equation (i)

$$2x + 1 = x + 3$$

$$2x - x = 3 - 1$$

$$x = 2$$

Solving equation (ii)

$$2y = y^2 + 2$$

$$y^2 - 2y + 2 = 0$$

$$D = b^2 - 4ac$$

$$= (-2)^2 - 4(i)(ii)$$

$$= 4 - 8$$

$$= -2$$

So, There is no real value of y from equation (ii).

Solving equation (iii)

$$y^2 - 5y = -6$$

$$y^2 - 5y + 6 = 0$$

$$y^2 - 3y - 2y + 6 = 0$$

$$y(y-3) - 2(y-3) = 0$$

$$(y-3)(y-2) = 0$$

$$y = 3 \quad or \quad y = 2$$

From solution of equation (i), (ii) and (iii), We can say that A and B can not be equal for any value of y.

Algebra of Matrices Ex 5.1 Q20

Given,

$$\begin{bmatrix} x+10 & y^2+2y \\ 0 & -4 \end{bmatrix} = \begin{bmatrix} 3x+4 & 3 \\ 0 & y^2-5y \end{bmatrix}$$

Since corresponding entries of equal matrices are equal, So

$$x+10 = 3x+4 \quad \text{---(i)}$$

$$y^2+2y = 3 \quad \text{---(ii)}$$

$$-4 = y^2-5y \quad \text{---(iii)}$$

Solving equation (i),

$$x+10 = 3x+4$$
$$x-3x = 4-10$$
$$-2x = -6$$
$$x = \frac{6}{2}$$

Solving equation (ii),

$$y^2+2y = 3$$
$$y^2+2y-3 = 0$$
$$y^2+3y-y-3 = 0$$
$$y(y+3)(y-1) = 0$$

$\Rightarrow \quad y = -3$ and $y = 1$

Solving equation (iii)

$$-4 = y^2-5y$$
$$y^2-5y+4 = 0$$
$$y^2-4y-y+(y-4) = 0$$
$$y(y-4)-1(y-4) = 0$$
$$(y-4)(y-1) = 0$$

$\Rightarrow \quad y = 4$ and $y = 1$

From equation (ii) *and* (iii),

The common value of y = 1

So, $x = 3, y = 1$

Algebra of Matrices Ex 5.1 Q21

$$A = \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}, \; B = \begin{bmatrix} 2a+2 & b^2+2 \\ 8 & b^2-5b \end{bmatrix}$$

Given that A = B

Corresponding element of two equal matrices are equal

$\Rightarrow \quad a + 4 = 2a + 2$, $3b = b^2 + 2$ and $-6 = b^2 - 5b$

$\Rightarrow \quad a - 2a = 2 - 4$, $b^2 - 3b + 2 = 0$ and $b^2 - 5b + 6 = 0$

$\Rightarrow \quad -a = -2$, $(b-1)(b-2) = 0$ and $(b-2)(b-3) = 0$

$\Rightarrow \quad a = 2$, $b = 1,2$ and $b = 2,3$

So value of a = 2, b=2 respectively.