Exercise 1.4

Q1. Which of the following product of matrices is conformable for multiplication?

(i) $\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} -2 \\ 3 \end{bmatrix}$ **(ii)** $\begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$

(iii) $\begin{bmatrix} 1 \\ -1 \end{bmatrix}\begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ **(iv)** $\begin{bmatrix} 1 & 2 \\ 0 & -1 \\ -1 & -2 \end{bmatrix}\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \end{bmatrix}$

(v) $\begin{bmatrix} 3 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ -2 & 3 \end{bmatrix}$

Solution:

Two matrices are conformable for multiplication if the numbers of columns of first matrix are equal to number of rows of second matrix.

So, according to the definition:

(i) is conformable for multiplication (because the first matrix has two columns and second matrix has same number of rows).

(ii) is conformable for multiplication (because the first matrix has two columns and second matrix has same number of rows).

(iii) is not conformable for multiplication (because the first matrix has just one column and second matrix has two rows).

(iv) is conformable for multiplication (because the first matrix has just two columns and second matrix has the same number of rows).

(v) is conformable for multiplication (because the first matrix has three columns and second matrix has same number of rows).

Q2. **If A =** $\begin{bmatrix} 3 & 0 \\ -1 & 2 \end{bmatrix}$, **B =** $\begin{bmatrix} 6 \\ 5 \end{bmatrix}$,

find (i) AB (ii) BA

(if possible)

Solution:

(i) AB

$= \begin{bmatrix} 3 & 0 \\ -1 & 2 \end{bmatrix} \times \begin{bmatrix} 6 \\ 5 \end{bmatrix}$

$= \begin{bmatrix} 3 \times 6 + 0 \times 5 \\ (-1) \times 6 + 2 \times 5 \end{bmatrix}$

$= \begin{bmatrix} 18 + 0 \\ -6 + 10 \end{bmatrix}$

$= \begin{bmatrix} 18 \\ 4 \end{bmatrix}$

So, AB $= \begin{bmatrix} 18 \\ 4 \end{bmatrix}$

(ii) BA

BA is not possible (because number of columns of B is

Not equal to number of rows of A)

Q3. Find the following products

(i) $\begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \end{bmatrix}$ **(ii)** $\begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} 5 \\ -4 \end{bmatrix}$

(iii) $\begin{bmatrix} -3 & 0 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \end{bmatrix}$ **(iv)** $\begin{bmatrix} 6 & -0 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \end{bmatrix}$

(v) $\begin{bmatrix} 1 & 2 \\ -3 & 0 \\ 6 & -1 \end{bmatrix} \begin{bmatrix} 4 & 5 \\ 0 & -4 \end{bmatrix}$ **(vi)** $\begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \end{bmatrix}$

Solution:

(i) $\begin{bmatrix} \mathbf{1} & \mathbf{2} \end{bmatrix}\begin{bmatrix} \mathbf{4} \\ \mathbf{0} \end{bmatrix}$

$= \quad [1 \times 4 + 2 \times 0]$

$= \quad [4 + 0]$

$= \quad [4]$

So, $\begin{bmatrix} 1 & 2 \end{bmatrix}\begin{bmatrix} 4 \\ 0 \end{bmatrix} = [4]$

(ii) $\begin{bmatrix} \mathbf{1} & \mathbf{2} \end{bmatrix}\begin{bmatrix} \mathbf{5} \\ \mathbf{-4} \end{bmatrix}$

$= \quad [1 \times 5 + 2 \times (-4)]$

$= \quad [5 - 8]$

$= \quad [-3]$

So, $\begin{bmatrix} 1 & 2 \end{bmatrix}\begin{bmatrix} 5 \\ -4 \end{bmatrix} = [-3]$

(iii) $\begin{bmatrix} \mathbf{-3} & \mathbf{0} \end{bmatrix}\begin{bmatrix} \mathbf{4} \\ \mathbf{0} \end{bmatrix}$

$= \quad [(-3) \times 4 + 0 \times 0]$

$= \quad [-12]$

So, $\begin{bmatrix} -3 & 0 \end{bmatrix}\begin{bmatrix} 4 \\ 0 \end{bmatrix} = [-12]$

(iv) $\begin{bmatrix} \mathbf{6} & \mathbf{-0} \end{bmatrix}\begin{bmatrix} \mathbf{4} \\ \mathbf{0} \end{bmatrix}$

$= \quad [6 \times 4 + 0 \times 0]$

$= \quad [24 + 0]$

$= \quad [24]$

So, $\begin{bmatrix} 6 & -0 \end{bmatrix}\begin{bmatrix} 4 \\ 0 \end{bmatrix} = \begin{bmatrix} 24 \end{bmatrix}$

(v) $\begin{bmatrix} 1 & 2 \\ -3 & 0 \\ 6 & -1 \end{bmatrix}\begin{bmatrix} 4 & 5 \\ 0 & -4 \end{bmatrix}$

$$= \begin{bmatrix} 1\times4+2\times0 & 1\times5+2\times(-4) \\ -3\times4+0\times0 & -3\times5+0\times(-4) \\ 6\times4+(-1)\times0 & 6\times5+(-1)\times(-4) \end{bmatrix}$$

$$= \begin{bmatrix} 4+0 & 5+(-8) \\ -12+0 & -15+0 \\ 24+0 & 30+4 \end{bmatrix}$$

$$= \begin{bmatrix} 4 & -3 \\ -12 & -15 \\ 24 & 34 \end{bmatrix}$$

So, $\begin{bmatrix} 1 & 2 \\ -3 & 0 \\ 6 & -1 \end{bmatrix}\begin{bmatrix} 4 & 5 \\ 0 & -4 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ -12 & -15 \\ 24 & 34 \end{bmatrix}$

Q4. Multiply the following matrices.

(a) $\begin{bmatrix} 2 & 3 \\ 1 & 1 \\ 0 & -2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}$ **(b)** $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ -1 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ **(d)** $\begin{bmatrix} 8 & 5 \\ 6 & 4 \end{bmatrix}\begin{bmatrix} 2 & -5/2 \\ -4 & 4 \end{bmatrix}$

(e) $\begin{bmatrix} -1 & 2 \\ 1 & 3 \end{bmatrix}\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

Solution:

(a) $\begin{bmatrix} 2 & 3 \\ 1 & 1 \\ 0 & -2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}$

$$= \begin{bmatrix} 2\times2+3\times3 & 2\times(-1)+3\times0 \\ 1\times2+1\times3 & 1\times(-1)+1\times0 \\ 0\times2+(-2)\times3 & 0\times(-1)+(-2)\times0 \end{bmatrix}$$

$$= \begin{bmatrix} 4+9 & -2+0 \\ 2+3 & -1+0 \\ 0-6 & 0+0 \end{bmatrix}$$

$$= \begin{bmatrix} 13 & -2 \\ 5 & -1 \\ -6 & 0 \end{bmatrix}$$

So, $\begin{bmatrix} 2 & 3 \\ 1 & 1 \\ 0 & -2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} 13 & -2 \\ 5 & -1 \\ -6 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} \mathbf{1} & \mathbf{2} & \mathbf{3} \\ \mathbf{4} & \mathbf{5} & \mathbf{6} \end{bmatrix}\begin{bmatrix} \mathbf{1} & \mathbf{2} \\ \mathbf{3} & \mathbf{4} \\ \mathbf{-1} & \mathbf{1} \end{bmatrix}$

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

$$= \begin{bmatrix} 1+6-3 & 2+8+3 \\ 4+15-6 & 8+20+6 \end{bmatrix}$$

$$= \begin{bmatrix} 4 & 13 \\ 13 & 34 \end{bmatrix}$$

So, $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 13 \\ 13 & 34 \end{bmatrix}$

(c) $\begin{bmatrix} \mathbf{1} & \mathbf{2} \\ \mathbf{3} & \mathbf{4} \\ \mathbf{1} & \mathbf{1} \end{bmatrix}\begin{bmatrix} \mathbf{1} & \mathbf{2} & \mathbf{3} \\ \mathbf{4} & \mathbf{5} & \mathbf{6} \end{bmatrix}$

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

$$= \begin{bmatrix} 1+8 & 2+10 & 3+12 \\ 3+16 & 6+20 & 9+24 \\ -1+4 & -2+5 & -3+6 \end{bmatrix}$$

$$= \begin{bmatrix} 9 & 12 & 15 \\ 19 & 26 & 33 \\ 3 & 3 & 3 \end{bmatrix}$$

So, $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} 9 & 12 & 15 \\ 19 & 26 & 33 \\ 3 & 3 & 3 \end{bmatrix}$

(d) $\begin{bmatrix} 8 & 5 \\ 6 & 4 \end{bmatrix}\begin{bmatrix} 2 & -5/2 \\ -4 & 4 \end{bmatrix}$

$= \begin{bmatrix} 8\times 2+5\times(-4) & 8\times(-\frac{5}{2})+5\times 4 \\ 6\times 2+4\times(-4) & 6\times(-\frac{5}{2})+4\times 4 \end{bmatrix}$

$= \begin{bmatrix} 16-20 & -20+20 \\ 12-16 & -15+16 \end{bmatrix}$

$= \begin{bmatrix} -4 & 0 \\ -4 & 1 \end{bmatrix}$

So, $\begin{bmatrix} 8 & 5 \\ 6 & 4 \end{bmatrix}\begin{bmatrix} 2 & -5/2 \\ -4 & 4 \end{bmatrix} = \begin{bmatrix} -4 & 0 \\ -4 & 1 \end{bmatrix}$

(e) $\begin{bmatrix} -1 & 2 \\ 1 & 3 \end{bmatrix}\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

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

$= \begin{bmatrix} 0+0 & 0+0 \\ 0+0 & 0+0 \end{bmatrix}$

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

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

Q5. Let A = $\begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}$, **B=** $\begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix}$ **and C =** $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$

Verify whether

(i) AB = BA **(ii) A (BC) = (AB) C**

(iii) A (B+C) = AB + AC **(iv) A (B-C) = AB – AC**

Solution:

(i) AB = BA

L.H.S = AB

$= \begin{bmatrix} -4-33 & -7-54 \\ 8+0 & 14+90 \end{bmatrix}$

$= \begin{bmatrix} -37 & -61 \\ 8 & 14 \end{bmatrix}$ ------------ (i)

R.H.S = (AB) C

$= \left(\begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix}\right)\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$

$= \left(\begin{bmatrix} -1\times 1+3\times(-3) & -1\times 2+3\times(-5) \\ 2\times 1+0\times(-3) & 2\times 2+0\times(-5) \end{bmatrix}\right)\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$

$= \begin{bmatrix} -1-9 & -2-15 \\ 2+0 & 4+0 \end{bmatrix} \times \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}$

$= \begin{bmatrix} -10 & -17 \\ 2 & 4 \end{bmatrix} \times \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}$

$= \begin{bmatrix} -10\times 2+(-17)\times 1 & -10\times 1+(-17)\times 3 \\ 2\times 2+4\times 1 & 2\times 1+4\times 3 \end{bmatrix}$

$= \begin{bmatrix} -20-17 & -10-51 \\ 4+4 & 2+12 \end{bmatrix}$

$= \begin{bmatrix} -37 & -61 \\ 8 & 14 \end{bmatrix}$ ------------ (ii)

From (i) and (ii), it is obvious that: L.H.S = R.H.S

A (BC) = (AB) C

(iii) A (B+C) = AB + AC

L.H.S = A (B+C)

$= \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}\left(\begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}\right)$

$= \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix} \times \left(\begin{bmatrix} 1+2 & 2+1 \\ -3+1 & -5+3 \end{bmatrix}\right)$

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

$$= \begin{bmatrix} -1\times3+3\times(-2) & -1\times3+3\times(-2) \\ 2\times3+0\times(-2) & 2\times3+0\times(-2) \end{bmatrix}$$

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

$$= \begin{bmatrix} -9 & -9 \\ 6 & 6 \end{bmatrix} \qquad \text{------------ (i)}$$

R.H.S = AB + AC

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

$$= \begin{bmatrix} -1\times1+3\times(-3) & -1\times2+3\times2 \\ 2\times(-3)+0\times(-3) & 2\times2+0\times(-5) \end{bmatrix} + \begin{bmatrix} -1\times2+3\times1 & -1\times1+3\times3 \\ 2\times2+0\times1 & 2\times1+0\times3 \end{bmatrix}$$

$$= \begin{bmatrix} -1-9 & -2-15 \\ 2+0 & 4+0 \end{bmatrix} + \begin{bmatrix} -2+3 & -1+9 \\ 4+0 & 2+0 \end{bmatrix}$$

$$= \begin{bmatrix} -10 & -17 \\ 2 & 4 \end{bmatrix} + \begin{bmatrix} 1 & 8 \\ 4 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 10+1 & -17+8 \\ 2+4 & 4+2 \end{bmatrix}$$

$$= \begin{bmatrix} -9 & -9 \\ -6 & 6 \end{bmatrix} \qquad \text{------------ (ii)}$$

From (i) and (ii), it is proved that L.H.S = R.H.S

A (B+C) = AB + AC

(iv) A (B-C) = AB – AC

L.H.S = A (B-C)

$$= \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix} \left(\begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix} \right)$$

$$= \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix} \times \left(\begin{bmatrix} 1-2 & 2-1 \\ -3-1 & -5-3 \end{bmatrix} \right)$$

$$= \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix} \times \begin{bmatrix} -1 & 1 \\ -4 & -8 \end{bmatrix}$$

$$= \begin{bmatrix} -1\times(-1)+3\times(-4) & -1\times 1+3\times(-8) \\ 2\times(-1)+0\times(-4) & 2\times 1+0\times(-8) \end{bmatrix}$$

$$= \begin{bmatrix} 1-12 & -1-24 \\ -2+0 & 2+0 \end{bmatrix}$$

$$= \begin{bmatrix} 11 & -25 \\ -2 & 2 \end{bmatrix} \qquad \text{------------ (i)}$$

R.H.S = AB - AC

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

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

$$= \begin{bmatrix} -1-9 & -2-15 \\ 2+0 & 4+0 \end{bmatrix} - \begin{bmatrix} -2+3 & -1+9 \\ 4+0 & 2+0 \end{bmatrix}$$

$$= \begin{bmatrix} -10 & -17 \\ 2 & 4 \end{bmatrix} - \begin{bmatrix} 1 & 8 \\ 4 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} -10-1 & -17-8 \\ 2-4 & 4-2 \end{bmatrix}$$

$$= \begin{bmatrix} 11 & -25 \\ -2 & 2 \end{bmatrix} \qquad \text{------------ (ii)}$$

From (i) and (ii), it is proved that L.H.S = R.H.S

A (B-C) = AB – AC

Q6. For the matrices

A = $\begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}$, **B=** $\begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix}$, **C =** $\begin{bmatrix} -2 & 6 \\ 3 & -9 \end{bmatrix}$

Verify that

(i) $(AB)^t = B^t A^t$ **(ii)** $(BC)^t = C^t B^t$

(i) $(AB)^t = B^t A^t$

Solution:

L.H.S $= (AB)^t$

$= \left(\begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix} \times \begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix}\right)^t$

$= \left(\begin{bmatrix} -1 \times 1 + 3 \times (-3) & -1 \times 2 + 3 \times 2 \\ 2 \times (-3) + 0 \times (-3) & 2 \times 2 + 0 \times (-5) \end{bmatrix}\right)^t$

$= \left(\begin{bmatrix} -1-9 & -2-15 \\ 2+0 & 4+0 \end{bmatrix}\right)^t$

$= \left(\begin{bmatrix} -10 & -17 \\ 2 & 4 \end{bmatrix}\right)^t$

$= \begin{bmatrix} -10 & 2 \\ -17 & 4 \end{bmatrix}$ ------------- (i)

R.H.S $= B^t A^t$

$= \begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix}^t \times \begin{bmatrix} -1 & 3 \\ 2 & 0 \end{bmatrix}^t$

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

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

$= \begin{bmatrix} -1-9 & 2+0 \\ -2-15 & 4+0 \end{bmatrix}$

$= \begin{bmatrix} -10 & 2 \\ -17 & 4 \end{bmatrix}$ ------------- (ii)

From (i) and (ii), it is proved that L.H.S = R.H.S

$(AB)^t = B^t A^t$

(ii) $(BC)^t = C^t B^t$

L.H.S $= (BC)^t$

$$= \left(\begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix} \times \begin{bmatrix} -2 & 6 \\ 3 & -9 \end{bmatrix}\right)^t$$

$$= \left(\begin{bmatrix} 1\times(-2)+2\times 3 & 1\times 6+2\times(-9) \\ -3\times(-2)+(-5)\times 3 & -3\times 6+(-5)\times(-9) \end{bmatrix}\right)^t$$

$$= \left(\begin{bmatrix} -2+6 & 6-18 \\ 6-15 & -18+45 \end{bmatrix}\right)^t$$

$$= \left(\begin{bmatrix} 4 & -12 \\ -9 & 27 \end{bmatrix}\right)^t$$

$$= \begin{bmatrix} 4 & -9 \\ -12 & 27 \end{bmatrix} \quad \text{------------- (i)}$$

R.H.S $= C^t B^t$

$$= \begin{bmatrix} -2 & 6 \\ 3 & -9 \end{bmatrix}^t \times \begin{bmatrix} 1 & 2 \\ -3 & -5 \end{bmatrix}^t$$

$$= \begin{bmatrix} -2 & 3 \\ 6 & -9 \end{bmatrix} \times \begin{bmatrix} 1 & -3 \\ 2 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} -2\times 1+3\times 2 & 2\times(-3)+3\times(-5) \\ 6\times 1+(-9)\times 2 & 6\times(-3)+(-9)\times(-5) \end{bmatrix}$$

$$= \begin{bmatrix} -2+6 & 6+15 \\ 6-18 & -18+45 \end{bmatrix}$$

$$= \begin{bmatrix} 4 & -9 \\ -12 & 27 \end{bmatrix} \quad \text{------------- (ii)}$$

From (i) and (ii), hence proved L.H.S = R.H.S

$(BC)^t = C^t B^t$