

Step-1

The objective is to determine whether the provided following statement is true or false.

(a) If A^2 is defined then A is necessarily square.

(b) If AB and BA are defined then A and B are square.

(c) If AB and BA are defined then AB and BA are square.

(d) If $AB = B$ then $A = I$

Step-2

(a)

Consider the provided statement in part (a).

According to the multiplication property of matrix, the number of row in first matrix is must be equal to the number of column in the second matrix.

Therefore, the given statement is **true**.

Step-3

(b)

Consider the provided statement in part (b).

Example: Let the two matrices are $A_{1 \times 2}$ and $B_{2 \times 1}$,

$$A_{1 \times 2} \cdot B_{2 \times 1} = (AB)_{1 \times 1}$$

$$B_{2 \times 1} \cdot A_{1 \times 2} = (BA)_{2 \times 2}$$

But A and B are not square matrices

Thus, the statement is **false**.

Step-4

(c)

Consider the provided statement in part ^(c).

According to the multiplication property of matrix, the number of row in first matrix is must be equal to the number of column in the second matrix.

Therefore, the given statement is **true**.

Step-5

^(d)

Consider the provided statement in part ^(d).

According to the property of identity matrix, let a matrix A then

$$AI = A$$

Therefore, the given statement is **true**.