

MS-A0001 - Matrix Algebra, 26.10.2020-08.12.2020

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Started on	Saturday, 7 November 2020, 6:46 PM
State	Finished
Completed on	Saturday, 7 November 2020, 7:00 PM
Time taken	14 mins 9 secs
Grade	2.00 out of 2.00 (100%)

Question 1

Flag question Mark 1.00 out of 1.00 Correct

Let $A = \begin{bmatrix} 8 & 8 & 2 \\ 6 & 3 & 6 \\ 5 & 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 1 & 7 \\ 6 & 7 & 8 \\ 9 & 5 & 9 \end{bmatrix}$.

Calculate $A + B$, $5B$ and AB .

$A + B = \begin{bmatrix} 15 & 9 & 9 \\ 12 & 10 & 14 \\ 14 & 7 & 14 \end{bmatrix}$

Your last answer was interpreted as follows:

$$\begin{bmatrix} 15 & 9 & 9 \\ 12 & 10 & 14 \\ 14 & 7 & 14 \end{bmatrix}$$

$5B = \begin{bmatrix} 35 & 5 & 35 \\ 30 & 35 & 40 \\ 45 & 25 & 45 \end{bmatrix}$

Your last answer was interpreted as follows:

$$\begin{bmatrix} 35 & 5 & 35 \\ 30 & 35 & 40 \\ 45 & 25 & 45 \end{bmatrix}$$

$AB = \begin{bmatrix} 122 & 74 & 138 \\ 114 & 57 & 120 \\ 92 & 44 & 96 \end{bmatrix}$

Your last answer was interpreted as follows:

$$\begin{bmatrix} 122 & 74 & 138 \\ 114 & 57 & 120 \\ 92 & 44 & 96 \end{bmatrix}$$

Your answer is correct!
Your answer is correct!
The matrix sum is correct.
Marks for this submission: 0.33/0.33.
Your answer is correct!
Your answer to $5B$ is correct.
Marks for this submission: 0.33/0.33.
Your answer is correct!
Your answer to AB is correct.
Marks for this submission: 0.33/0.33.

Worked solution:

$$A + B = \begin{bmatrix} 8+7 & 8+1 & 7+2 \\ 2 \cdot 6 & 7+3 & 8+6 \\ 9+5 & 5+2 & 9+5 \end{bmatrix} = \begin{bmatrix} 15 & 9 & 9 \\ 12 & 10 & 14 \\ 14 & 7 & 14 \end{bmatrix}.$$

$$5B = 5 \begin{bmatrix} 7 & 1 & 7 \\ 6 & 7 & 8 \\ 9 & 5 & 9 \end{bmatrix} = \begin{bmatrix} 5 \cdot 7 & 5 \cdot 1 & 5 \cdot 7 \\ 5 \cdot 6 & 5 \cdot 7 & 5 \cdot 8 \\ 5 \cdot 9 & 5 \cdot 5 & 5 \cdot 9 \end{bmatrix} = \begin{bmatrix} 35 & 5 & 35 \\ 30 & 35 & 40 \\ 45 & 25 & 45 \end{bmatrix}.$$

$$AB = \begin{bmatrix} 8 & 8 & 2 \\ 6 & 3 & 6 \\ 5 & 2 & 5 \end{bmatrix} \begin{bmatrix} 7 & 1 & 7 \\ 6 & 7 & 8 \\ 9 & 5 & 9 \end{bmatrix} = \begin{bmatrix} 8 \cdot (7) + 8 \cdot (6) + 2 \cdot (9) & 8 \cdot (1) + 8 \cdot (7) + 2 \cdot (5) & 8 \cdot (7) + 8 \cdot (7) + 2 \cdot (3) \\ 6 \cdot (7) + 3 \cdot (6) + 6 \cdot (9) & 6 \cdot (1) + 3 \cdot (7) + 6 \cdot (5) & 6 \cdot (7) + 3 \cdot (7) + 6 \cdot (3) \\ 5 \cdot (7) + 2 \cdot (6) + 5 \cdot (9) & 5 \cdot (1) + 2 \cdot (7) + 5 \cdot (5) & 5 \cdot (7) + 2 \cdot (7) + 5 \cdot (3) \end{bmatrix}$$

A correct answer is $\begin{bmatrix} 15 & 9 & 9 \\ 12 & 10 & 14 \\ 14 & 7 & 14 \end{bmatrix}$.

A correct answer is $\begin{bmatrix} 35 & 5 & 35 \\ 30 & 35 & 40 \\ 45 & 25 & 45 \end{bmatrix}$.

A correct answer is $\begin{bmatrix} 122 & 74 & 138 \\ 114 & 57 & 120 \\ 92 & 44 & 96 \end{bmatrix}$.

Question 2

Flag question Mark 1.00 out of 1.00 Correct

Let $A = \begin{bmatrix} 2 & 0 & 2 \\ 1 & 2 & 2 \\ 3 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 1 & 0 \\ 2 & 1 & 4 \\ 2 & 4 & 2 \end{bmatrix}$. Calculate $AB - BA$. What can we deduce if $AB - BA = 0$?

Answer: $\begin{bmatrix} 3 & 8 & -4 \\ -6 & 5 & -6 \\ 3 & 6 & -8 \end{bmatrix}$

Your last answer was interpreted as follows:

$$\begin{bmatrix} 3 & 8 & -4 \\ -6 & 5 & -6 \\ 3 & 6 & -8 \end{bmatrix}$$

Your answer is correct!
Marks for this submission: 1.00/1.00.

Worked solution:

$$AB = \begin{bmatrix} 2 & 0 & 2 \\ 1 & 2 & 2 \\ 3 & 1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 3 & 1 & 0 \\ 2 & 1 & 4 \\ 2 & 4 & 2 \end{bmatrix} = \begin{bmatrix} 2 \cdot 3 + 0 \cdot 2 + 2 \cdot 2 & 2 \cdot 1 + 0 \cdot 1 + 2 \cdot 4 & 2 \cdot 0 + 0 \cdot 4 + 2 \cdot 2 \\ 1 \cdot 3 + 2 \cdot 2 + 2 \cdot 2 & 1 \cdot 1 + 2 \cdot 1 + 2 \cdot 4 & 1 \cdot 0 + 2 \cdot 4 + 2 \cdot 2 \\ 3 \cdot 3 + 1 \cdot 2 + 3 \cdot 2 & 3 \cdot 1 + 1 \cdot 1 + 3 \cdot 4 & 3 \cdot 0 + 1 \cdot 4 + 3 \cdot 2 \end{bmatrix} = \begin{bmatrix} 10 & 10 & 4 \\ 11 & 11 & 12 \\ 17 & 16 & 10 \end{bmatrix}$$

$$BA = \begin{bmatrix} 3 & 1 & 0 \\ 2 & 1 & 4 \\ 2 & 4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 & 2 \\ 1 & 2 & 2 \\ 3 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 3 \cdot 2 + 1 \cdot 1 + 0 \cdot 3 & 3 \cdot 0 + 1 \cdot 2 + 0 \cdot 1 & 3 \cdot 2 + 1 \cdot 2 + 0 \cdot 3 \\ 2 \cdot 2 + 1 \cdot 1 + 4 \cdot 3 & 2 \cdot 0 + 1 \cdot 2 + 4 \cdot 1 & 2 \cdot 2 + 1 \cdot 2 + 4 \cdot 3 \\ 2 \cdot 2 + 4 \cdot 1 + 2 \cdot 3 & 2 \cdot 0 + 4 \cdot 2 + 2 \cdot 1 & 2 \cdot 2 + 4 \cdot 2 + 2 \cdot 3 \end{bmatrix} = \begin{bmatrix} 7 & 2 & 8 \\ 17 & 6 & 18 \\ 14 & 10 & 18 \end{bmatrix}$$

$$AB - BA = \begin{bmatrix} 10 & 10 & 4 \\ 11 & 11 & 12 \\ 17 & 16 & 10 \end{bmatrix} - \begin{bmatrix} 7 & 2 & 8 \\ 17 & 6 & 18 \\ 14 & 10 & 18 \end{bmatrix} = \begin{bmatrix} 10-7 & 10-2 & 4-8 \\ 11-17 & 11-6 & 12-18 \\ 17-14 & 16-10 & 10-18 \end{bmatrix} = \begin{bmatrix} 3 & 8 & -4 \\ -6 & 5 & -6 \\ 3 & 6 & -8 \end{bmatrix}.$$

Matrix $AB - BA$ is called the commutator of A and B . If the commutator equals zero the product of the matrices commutes and if it is nonzero the matrices do not commute. In other words $AB = BA$ iff $AB - BA = 0$.

A correct answer is $\begin{bmatrix} 3 & 8 & -4 \\ -6 & 5 & -6 \\ 3 & 6 & -8 \end{bmatrix}$.

Finish review

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Lecture 4 »



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