

CSPB 2820 - Truong - Linear Algebra with Computer Science Applications

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Started on Tuesday, 24 October 2023, 9:55 PM

State Finished

Completed on Tuesday, 24 October 2023, 9:59 PM

Time taken 3 mins 29 secs

Marks 20.00/20.00

Grade 10.00 out of 10.00 (100%)

Question 1

Correct

Mark 1.00 out of 1.00

Calculate the products AB and BA when the matrices are $A = \begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 9 \\ 2 \\ 4 \\ 7 \end{bmatrix}$.

 $AB =$

53

Your last answer was interpreted as follows: 53

 $BA =$

9	18	27	36
2	4	6	8
4	8	12	16
7	14	21	28

Your last answer was interpreted as follows:

9	18	27	36
2	4	6	8
4	8	12	16
7	14	21	28

Your answer is correct!

Your answer is correct!

The product AB is correct!

Marks for this submission: 0.50/0.50.

Your answer is correct!

The product BA is correct!

Marks for this submission: 0.50/0.50.

Worked solution:

$$AB = 1 \cdot 9 + 2 \cdot 2 + 3 \cdot 4 + 4 \cdot 7 = 53. \quad BA = \begin{bmatrix} 9 \cdot 1 & 9 \cdot 2 & 9 \cdot 3 & 9 \cdot 4 \\ 2 \cdot 1 & 2 \cdot 2 & 2 \cdot 3 & 2 \cdot 4 \\ 4 \cdot 1 & 4 \cdot 2 & 4 \cdot 3 & 4 \cdot 4 \\ 7 \cdot 1 & 7 \cdot 2 & 7 \cdot 3 & 7 \cdot 4 \end{bmatrix} = \begin{bmatrix} 9 & 18 & 27 & 36 \\ 2 & 4 & 6 & 8 \\ 4 & 8 & 12 & 16 \\ 7 & 14 & 21 & 28 \end{bmatrix}.$$

Question 2

Correct

Mark 3.00 out of 3.00

Let $n = 3$ and $m = 5$

and

$$x = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

A =

$$\begin{bmatrix} 1 & 2 & 3 \\ 3 & 3 & 3 \\ 5 & 5 & 5 \\ 7 & 7 & 7 \\ 7 & 7 & 8 \end{bmatrix}$$

 $y =$

$$\begin{bmatrix} a \\ b \\ c \\ d \\ e \end{bmatrix}$$

Which of the following is a vector valued function from \mathbb{R}^n to \mathbb{R}^m ?

- ☐ a. $f(x) = Ay$
- ☐ b. $f(x) = xA$
- ☐ c. $f(x) = xy$
- ☒ d. $f(x) = Ax$
- ☐ e. None of these, an n - vector cannot "turn into" an m vector. n and m cannot be different lengths.



Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.

Question **3**

Correct

Mark 10.00 out of 10.00

Consider the linear function $f: \mathbb{R}^n \rightarrow \mathbb{R}^m$, defined by $f(x) = A x$

It then satisfies the superposition property:

$$f(ax + by) = a f(x) + b f(y)$$

holds for all n -vectors x and y , and all scalars a and b .

Match the correct description of the variables in the superposition property.

by	n-vector	✓
a	scalar	✓
ax	n-vector	✓
$f(ax + by)$	m-vector	✓
b	scalar	✓
$bf(y)$	m-vector	✓
$a f(x) + b f(y)$	m-vector	✓
$af(x)$	m-vector	✓
$ax + by$	n-vector	✓

Your answer is correct.

Correct

Marks for this submission: 10.00/10.00.

Question 4

Correct

Mark 3.00 out of 3.00

Consider a vector valued function $f: \mathbb{R}^n \rightarrow \mathbb{R}^m$ expressed as,

$$f(x) = A x + b$$

What is b ?

Select one or more:

- ☐ $(n + m)$ scalar
- ☒ Specifically it is $f(0)$ ✓

See page VMLS p.150

- ☐ a vector valued function
- ☐ scalar
- ☐ n -vector
- ☒ m -vector ✓

Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.

Question 5

Correct

Mark 3.00 out of 3.00

Consider an **affine** vector valued function $f: \mathbb{R}^n \rightarrow \mathbb{R}^m$

$$\text{If } f(\alpha x + \beta y) = \alpha f(x) + \beta f(y)$$

then,

which of the following are possible values of α and β ?

.7 and .3

Possible



.9 and .1

Possible



7 & 10

Not possible



any n-vector for α

any m- vector for β

Not possible



1 and 1

Not possible



The unit vector for each

Not possible



Your answer is correct.

Correct

Marks for this submission: 3.00/3.00.