

LaTeX document for LAFF class notes

Homework 1.4.3: Dot or Inner Product(DOT)

Homework 1.4.3.1

$$\begin{bmatrix} 2 \\ 5 \\ -6 \\ 1 \end{bmatrix}^T \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

= Can't be done

Homework 1.4.3.2

$$\begin{bmatrix} 2 \\ 5 \\ -6 \\ 1 \end{bmatrix}^T \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} = 2$$

Homework 1.4.3.3

$$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}^T \begin{bmatrix} 2 \\ 5 \\ -6 \\ 1 \end{bmatrix} = 2$$

Homework 1.4.3.4

For $x, y \in \mathbb{R}^n$,
 $x^T y = y^T x$.

ALWAYS

Homework 1.4.3.5

$$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}^T \left(\begin{bmatrix} 2 \\ 5 \\ -6 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} \right) = 12$$

Homework 1.4.3.6

$$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}^T + \begin{bmatrix} 2 \\ 5 \\ -6 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}^T \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} = 12$$

Homework 1.4.3.7

$$\left(\begin{bmatrix} 2 \\ 5 \\ -6 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix} \right)^T \begin{bmatrix} 1 \\ 0 \\ 0 \\ 2 \end{bmatrix} = 13$$

Homework 1.4.3.8

For $x, y, z \in \mathbb{R}^n$,

$$x^T(y + z) = x^T y + x^T z$$

ALWAYS

Homework 1.4.3.9

For $x, y, z \in \mathbb{R}^n$,

$$(x + y)^T z = x^T z + y^T z$$

ALWAYS

Homework 1.4.3.10

For $x, y, z \in \mathbb{R}^n$,

$$(x + y)^T (x + y) = x^T x + 2x^T y + y^T y .$$

ALWAYS

Homework 1.4.3.11

For $x, y, z \in \mathbb{R}^n$,

when $x^T y = 0$, $x = 0$ or $y = 0$.

SOMETIMES

Homework 1.4.3.12

For $x \in \mathbb{R}^n$,

when $e_i^T x = x^T e_i = \chi_i$,

where χ_i equals the i th component of x

ALWAYS