COM1033 FOUNDATIONS OF COMPUTING II

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Contents

1 Vectors

1.1 Vector Definition

Let n $\in \mathbb{N}$ and n > 0.

The set of all vectors is the cartesian product of $\mathbb{R}$ by n times.

$$\mathbb{R}^3 = \{(x, y, z) \mid x, y, z \in \mathbb{R}\}$$

1.2 Vector Operations

1.2.1 Addition

1.2.2 Scalar Multiplication

1.2.3 Dot Product / Scalar Product

1.2.4 Exercises

Question 1

I forgot.

Question 2

$$\vec{u} = \begin{pmatrix} 3 \\ 5 \\ -4 \end{pmatrix} \quad \vec{v} = \begin{pmatrix} 2 \\ 2 \\ 4 \end{pmatrix}$$

$$\begin{aligned} \vec{u}\dot{\vec{v}} &= 3 \cdot 2 + 5 \cdot 2 + -4 \cdot 4 \\ &= 6 + 10 - 16 \\ &= 0 \end{aligned}$$

Question 3

$$\vec{v_1} = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix} \quad \vec{v_2} = \begin{pmatrix} 0 \\ 2 \\ 2 \end{pmatrix} \quad \vec{v_3} = \begin{pmatrix} 1 \\ 6 \\ 5 \end{pmatrix} \tag{1}$$

$$\text{when: } \lambda_1 = 1, \lambda_2 = 2, \lambda_3 = -1 \tag{2}$$

$$\lambda_1\vec{v_1} + \lambda_2\vec{v_2} + \lambda_3\vec{v_3} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \tag{3}$$

Question 4:

Let $v_1, v_2, ..., v_n$ be n linearly independent vectors. Consider the the set of scalers $\lambda_1, \lambda_2, ..., \lambda_n$ such that $\lambda_1 v_1 + \lambda_2 v_2 + ... + \lambda_n v_n = 0$. Find alternative sets of the scalers.

Just multiply all the scalars by a common scaling factor, let's say μ

Question 5:

a_3 is on the same line