Vectors & Matrices

Accompaniment material for 93APM3 Applied Mathematics 3

AY24/25 Sem 2

This set of notes is based on the lectures as delivered in AY25/26 by Dr Chen Ming. It is intended as a brief revision prior to reading *Introduction to Linear Algebra*.

Contents

Vectors

1.0.1 The Basics

Definition 1.0.1. A vector $\vec{v}$ is a quantity with both direction and magnitude.

$$\vec{v} = (v_x, v_y, v_z)$$

Definition 1.0.2. The column form of a vector v is

$$\vec{v} = \begin{bmatrix} v_x \\ v_y \\ v_z \end{bmatrix}$$

Definition 1.0.3. The magnitude of a vector $\vec{v}$ is given by

$$|\vec{p}| = \sqrt{v_x{}^2 + v_y{}^2 + v_z{}^2}$$

Definition 1.0.4. The unit vector $\hat{v}$ of any vector $\vec{v}$ is

$$\hat{v} = \frac{\vec{v}}{|\vec{v}|}$$

Definition 1.0.5. The **scalar product** or dot product of two vectors is

$$\vec{a} \cot \vec{b} = |\vec{a}||\vec{b}| \cos \theta$$

where θ is the angle between $\vec{a}$ and $\vec{b}$.