Advanced Engineering Mathematics

Vectors

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1 Vectors in $\mathbb{R}^n$

1.1 Definition and Representation of Vectors

> **Key Concept**
>
> A **vector** is a quantity that has both **magnitude** and **direction**. It is commonly represented as an ordered list of real numbers:
>
> $$\mathbf{v} = [v_1, v_2, v_3, \ldots, v_n]$$
>
> where $\mathbf{v} \in \mathbb{R}^n$.

A **scalar** is a quantity described only by magnitude (a single number), such as temperature, mass, or time.

Vectors can be interpreted geometrically as directed line segments (arrows), and algebraically as ordered tuples.

1.1.1 Position Vector

> **Key Concept**
>
> The **position vector** of a point $P(x_1, x_2, \ldots, x_n)$ is the vector drawn from the origin to the point:
> $$\mathbf{r} = [x_1, x_2, \ldots, x_n]$$