

# Mathematics

## A Reference Manual

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### Abstract

This document covers Calculus, Linear Algebra, Math Analysis and Differential Equations.

## Calculus 3

This section largely follows Chapters 12-16 in Calculus Early Transcendentals.

### Chapter 12: Vectors and Geometry of Space

#### Distance Formula in 3D

$$|P_1P_2| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2} \quad (1)$$

#### Equation of a Sphere

$$(x - h)^2 + (y - k)^2 + (z - l)^2 = r^2 \quad (2)$$

r: Radius of sphere

C(h,k,l): Center of sphere

#### Unit Vectors

Suppose that  $\vec{a} \neq 0$  and that  $\vec{u}$  has the same direction of  $\vec{a}$  :

$$\vec{u} = \frac{1}{|\vec{a}|} \vec{a} = \frac{\vec{a}}{|\vec{a}|} \quad (3)$$