

MATH 104: WORKSHEET 1

1. Concepts

- (1) Surfaces
- (2) Vectors

2. Discussions

Definition 2.1 (Surface in 3D). An equation with three variables $f(x, y, z) = 0$ represents a surface in \mathbb{R}^3 .

Question 1. What are the surfaces that the following equations represent in \mathbb{R}^3 ?

(1) $(x - 1)^2 + (y - 1)^2 + (z - 2)^2 = 9$

(2) $(x - 1)^2 + \frac{1}{4}(y - 3)^2 = 4, 1 \leq z \leq 2$

$$(3) \ 3x + 3y - 5z = 0$$

Definition 2.2. A point $x \in \mathbb{R}^3$ is a tuple

$$x = (x_1, x_2, x_3) .$$

A vector $\vec{x} \in \mathbb{R}^3$ is a tuple

$$\vec{v} = \langle v_1, v_2, v_3 \rangle .$$

A vector represents a quantity that has a length and a direction (starting and ending points are not important).

Question 2. What is the length of

$$(1) \ \langle 1, 2, 3 \rangle ?$$

$$(2) \ \vec{v} + \vec{w} \text{ where } \vec{v} = \langle 1, 2, 3 \rangle \text{ and } \vec{w} = \langle 2, 3, 1 \rangle ?$$

(3) $\vec{w} = 10\vec{v}$ where $\vec{v} = \langle 1, 2, 3 \rangle$?