

Worksheet 1

10.1 - Three-Dimensional Coordinate Systems.
--

1. Compare \mathbb{R} , \mathbb{R}^2 , and \mathbb{R}^3 .

(a) Draw the representation of $x = 2$ in:

\mathbb{R} : \mathbb{R}^2 : \mathbb{R}^3 :

(b) How many dimensions is the representation of $x = 2$ in:

\mathbb{R} : \mathbb{R}^2 : \mathbb{R}^3 :

2. Distance formulas.

(a) What is the distance between two points $A = (a_1, a_2)$ and $B = (b_1, b_2)$ in \mathbb{R}^2 ?

(b) What is the distance between two points $A = (a_1, a_2, a_3)$ and $B = (b_1, b_2, b_3)$ in \mathbb{R}^3 ?

(c) Can you generalize this result for points $A = (a_1, a_2, \dots, a_n)$ and $B = (b_1, b_2, \dots, b_n)$ in \mathbb{R}^n ?

3. Equation of a sphere in \mathbb{R}^3 .

(a) Write the equation of a sphere with center (x_1, y_1, z_1) and radius r in \mathbb{R}^3 .

(b) Write the equation of a sphere with center $(-7, 0, 3)$ and radius $\sqrt{2}$ in \mathbb{R}^3 .

(c) Write the equation that represents the part of a sphere centered at the origin with radius $(\frac{2}{3})^{\frac{3}{2}}$ in the first octant:

10.2 - Vectors.

1. Length of a vector.

(a) What is the length of a vector $\vec{a} = \langle a_1, a_2 \rangle$ in \mathbb{R}^2 ?

(b) What is the length of a vector $\vec{a} = \langle a_1, a_2, a_3 \rangle$ in \mathbb{R}^3 ?

(c) Can you generalize your findings to determine the length of a vector $\vec{a} = \langle a_1, a_2, \dots, a_n \rangle$ in \mathbb{R}^n ?

2. More on vector length.

(a) What vector is represented by the directed line segment with initial point $A = (0, 1, 2)$ and terminal point $B = (-2, 0, 5)$?

(b) How about the vector with B as the initial point and A as the terminal point (use same points as part (a)).

(c) Compare your answers from part (a) and (b). Can you make any generalizations? Will your generalizations always hold? Why or why not?