

Section 12.1: Three-Dimensional Coordinate Systems

Problem 1. Which of the points $A = (-4, 0, -1)$, $B = (3, 1, -5)$, and $C = (2, 4, 6)$ is closest to the yz -plane? Which points lie in the xz -plane?

Problem 2.

- What are the projections of the point $(2, 3, 5)$ on the xy -, yz -, and xz -planes?
- Draw a rectangular box with the origin and $(2, 3, 5)$ as opposite points and with its faces parallel to the coordinate planes. Label all the points of the box.
- Find the length of the diagonal of the box.

Problem 3. Describe and/or sketch the regions of \mathbb{R}^3 represented by the following equation(s) or inequalities.

(a) $x^2 + z^2 \leq 25, 0 \leq y \leq 2$ (b) $1 \leq x^2 + 2x + y^2 + z^2 \leq 5$ (c) $0 \leq x \leq 3, 0 \leq y \leq 3, 0 \leq z \leq 3.$

Section 12.2: Vectors

Problem 4. Find $\mathbf{a} + \mathbf{b} - \mathbf{c}$, $\mathbf{a} + 2\mathbf{b}$, $|\mathbf{a}|$, and $|\mathbf{a} - \mathbf{c}|$ for the following sets of vectors in \mathbb{R}^2 :

$$(a) \mathbf{a} = \langle 1, 2 \rangle, \mathbf{b} = \langle -2, 3 \rangle, \mathbf{c} = \langle 3, 3 \rangle \quad (b) \mathbf{a} = 3\mathbf{i} - 5\mathbf{j}, \mathbf{b} = -\mathbf{i} - 2\mathbf{j}, \mathbf{c} = \mathbf{i} + \mathbf{j}$$

Illustrate all of the vectors in part (b) geometrically.

Problem 5. Find the vector in \mathbb{R}^3 that has the same direction as $\langle 6, 2, -3 \rangle$, but has length 4.