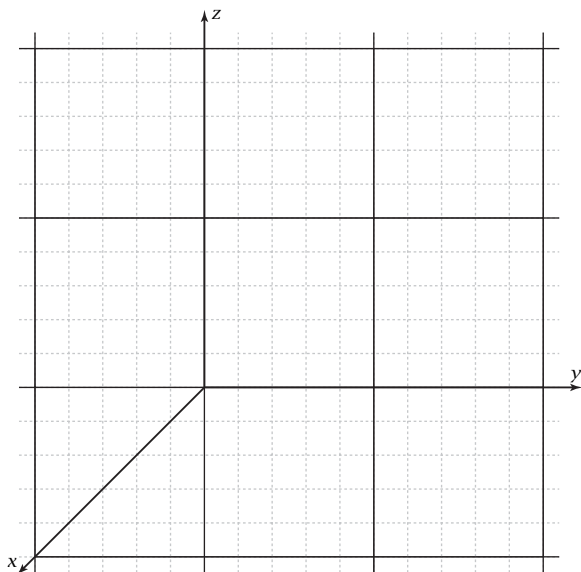


Exploration 10-3a: Introduction to Three-Dimensional Vectors

Date: _____

Objective: Plot and do operations with three-dimensional vectors by using their components.

1. Draw vector $\vec{v} = 5\vec{i} + 7\vec{j} + 10\vec{k}$ as a position vector in three-dimensional coordinates. Do this by plotting the three components head to tail, starting with $5\vec{i}$. Show the “box” surrounding the vector that makes the vector look three-dimensional.



2. Show that you know what the three unit vectors \vec{i} , \vec{j} , and \vec{k} mean by sketching them starting from the origin in Problem 1.
3. Find the length of \vec{v} in Problem 1 using the three-dimensional Pythagorean theorem.
4. Write the vector $3\vec{v}$ as a sum of components.
5. Show by means of the three-dimensional Pythagorean theorem that $3\vec{v}$ is really three times as long as \vec{v} .

6. Write as a sum of components a *unit* vector in the direction of \vec{v} .

7. Let $\vec{a} = 4\vec{i} - 3\vec{j} + 8\vec{k}$. Quickly find $\vec{v} + \vec{a}$, where $\vec{v} = 5\vec{i} + 7\vec{j} + 10\vec{k}$, as in Problem 1.

8. Find displacement vector \vec{b} from the point (1, 5, 2) to the point (7, 3, 11).

9. Find the position vector of the point 0.3 of the way from the point (1, 5, 2) to the point (7, 3, 11).

10. What did you learn as a result of doing this Exploration that you did not know before?