# Lecture I Notes

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# 1 Chapter 12

## 1.1 Vectors (12.1)

Basic Vector manipulations:

Multiplication or Division: some vector, $\vec{a}$, multiplied or divided by a constant, $k$, is simply the magnitude (length) of the vector multiplied or divided by the scalar
Addition or Subtraction: The addition or subtraction of two vectors forms a triangle. Finding the third side of the triangle will give you the magnitude (length) of the resulting vector.

The distance between to points, or the magnitude of the vector may be found using the distance formula:

$$\sqrt{(x_1 - x_2) + (y_1 - y_2)}$$

Or, in three dimensions:

$$\sqrt{(x_1 - x_2) + (y_1 - y_2) + (z_1 - z_2)}$$

These equations come from the circular or spherical formula for radius:

$$(x-h)^2 + (y-k)^2 = r^2, \text{and } (x-h)^2 + (y-k)^2 + (z-c)^2 = r^2$$

*Practice Problem:*
*What is the radius and center of the figure?*

$$x^2+y^2+z^2-2x-4y+8z = 15x^2-2x+y^2-4y+z^2+8z = 15(x-1)^2+(y-2)^2+(z+4)^2 = 36$$

Sphere with center at $(1, 2, -4)$, and radius 6