

## 14.4: Vector Normalization

A vector of any given length can be divided by its modulus to create a unit vector (i.e. a vector of unit length). We will see applications of unit (or normalized) vectors in the next chapter.

For example, the vector

$$\mathbf{u} = \hat{\mathbf{i}} + \hat{\mathbf{j}} + i\hat{\mathbf{k}}$$

has a magnitude:

$$|\mathbf{u}|^2 = 1^2 + 1^2 + (-i)(i) = 3 \rightarrow |\mathbf{u}| = \sqrt{3}$$

Therefore, to normalize this vector we divide all the components by its length:

$$\hat{\mathbf{u}} = \frac{1}{\sqrt{3}}\hat{\mathbf{i}} + \frac{1}{\sqrt{3}}\hat{\mathbf{j}} + \frac{i}{\sqrt{3}}\hat{\mathbf{k}}$$

Notice that we use the “hat” to indicate that the vector has unit length.

Need help? The links below contain solved examples.

Operations with vectors: <http://tinyurl.com/mw4qzm8>

External links:

- The dot product: <http://patrickjmt.com/vectors-the-dot-product/>
- The cross product: <http://patrickjmt.com/the-cross-product/>
- The dot and cross product: <http://www.youtube.com/watch?v=enr7JqvehJs>

This page titled [14.4: Vector Normalization](#) is shared under a [CC BY-NC-SA 4.0](#) license and was authored, remixed, and/or curated by [Marcia Levitus](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.