



4 Normed vector spaces

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Introduction

- In this topic, we will introduce the next section
 - Defining the 2-norm for finite-dimensional vectors $\mathbf{R}^n$ and $\mathbf{C}^n$
 - Describing other norms on these spaces
 - Defining unit vectors
 - Describing norms on other vector spaces
 - Considering applications of norms





Norms of vectors

- A *norm* will be a measure of the *length* of a vector
 - We will use this to describe a characteristic of a vector
- In secondary school, you may have called something the *Euclidean length* of a vector
 - In mathematics and engineering, the term to describe the length is the “norm”





Outcomes

- Following this section, you will be able to:
 - Calculate the norm of a vector
 - Normalize a vector, making it a “unit” vector
 - Describe the properties of a norm
 - Have an understanding that there are different ways of measuring the length of a vector; i.e., different norms





Summary

- Following this topic, you now
 - Are aware of what the next few sections will cover
 - Understand we will be measuring the “length” of a vector
 - Understand that the term for “length” is “norm”





References

- [1] [https://en.wikipedia.org/wiki/Norm_\(mathematics\)](https://en.wikipedia.org/wiki/Norm_(mathematics))





Acknowledgments

None so far.





Colophon

These slides were prepared using the Cambria typeface. Mathematical equations use Times New Roman, and source code is presented using Consolas.

The photographs of flowers and a monarch butter appearing on the title slide and accenting the top of each other slide were taken at the Royal Botanical Gardens in October of 2017 by Douglas Wilhelm Harder. Please see

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for more information.





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