

Intro. Welcome to Math 226! You can call me:

Accessing Content. You can access public course content on our course webpage.

Private content, like your grades, can be accessed through Brightspace.

Be sure to use Brightspace to access our PollEverywhere and Gradescope courses.

Practice problems can be found in MyOpenMath.

Our MyOpenMath code and passkey are in a Brightspace announcement.

Public Webpage. On the public course webpage you can find the following.

- Announcements: public announcements. Private announcements are in Brightspace.
- Office hours: please stop by whenever you need help!
- Daily Schedule: use it to access handouts and other materials.
- Exam Reference Sheet: provided during exams. Regularly updated.
- Syllabus: read this thoroughly on your own.

Grade Breakdown. There are four grade categories.

- 60% → Topic Mastery: Evaluated through midterms and retakes.
- 5% → Lecture: Roughly 2 multiple choice polls per lecture.
- 5% → Discussion: Groupwork completed in discussion section each week.
- 30% → Final Exam: common final exam shared by all 226 students at USC.

Attendance. In-person attendance of lecture and discussion is required to earn the corresponding credit. A total of 10 dropped polls and 2 dropped groupworks are intended to account for absences due to sickness, family emergency, etcetera.

Recordings. Zoom recordings of lecture will be posted for review, but remote attendance of live lectures is not possible.

Generative AI. Its presence affects the nature of education.

- AI Use: At-home use is encouraged. In-classroom use is prohibited.
- No Homework: AI invalidates homework in its usual form, so there is none.

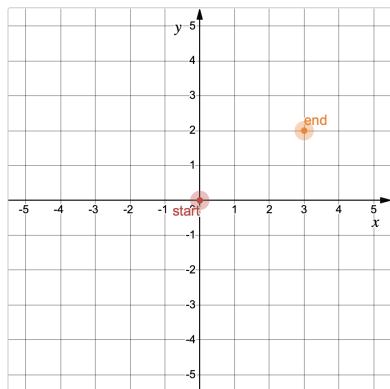
Practice. Suggested Problems from MyOpenMath are a substitute for homework.

- Posted after each lecture. Work through them regularly.
- Solutions revealed before corresponding exam.
- Feel free to use back-and-forth discussion with generative AI to assist. E.g. for
 - providing hints when you are stuck.
 - explorative questioning, e.g. "If this part were changed, then what?"
 - stripping problems to their cores.
 - revealing connections between the problems and other course content.
 - providing similar problems.
- Exam problems are largely based on suggested problems and lecture examples.

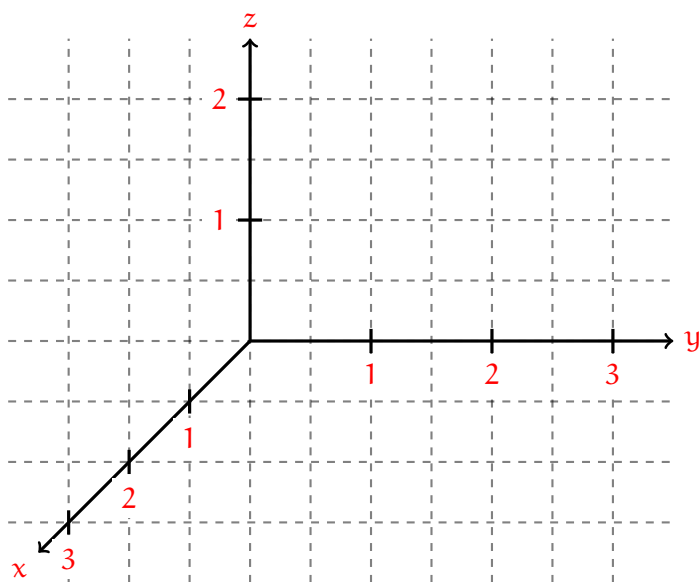
Groupwork problems are drawn from suggested problems.

Lecture 1. A1 – Vectors and Vector Operations.

A. **Vectors.** We begin by introducing vectors via the link below.



Let us sketch the point $P = (1, 3, 2)$ and its position vector $\vec{p} =$

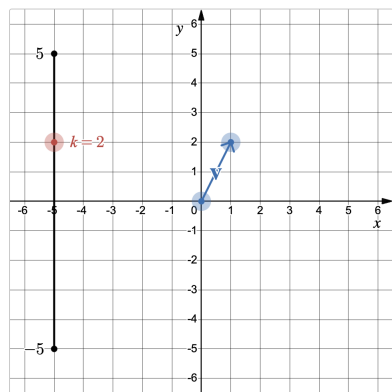


The position vector of the origin is called the **zero vector**.

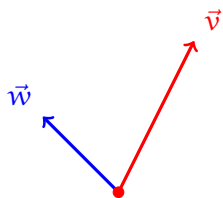
$\vec{0} =$

Let's sketch it above.

B. Vector Operations. Let's exhibit basic vector operations via the link below.



Example 1. Roughly sketch $2(\vec{v} - 2\vec{w})$ using the vectors $\vec{v}$ and $\vec{w}$ below.



Solution. First we use **distributivity** to distribute the outer 2.

$$2(\vec{v} - 2\vec{w}) =$$

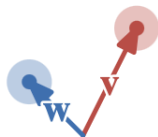
Next we use **associativity** to first multiply the scalars in front of the second vector.

$$\dots =$$

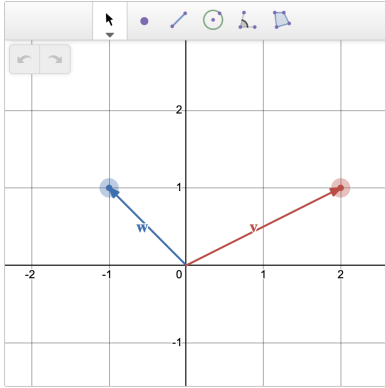
Lastly we interpret the $-$ as $+-$ to obtain:

$$\dots =$$

This is an example of **linear combination** of the vectors. Explore via the link.



C. **Dot Products and Length.** Explore the dot product of vectors via the link.



Example 2. Find the length of the vector $\vec{u} = -\frac{1}{13}\langle 3, 4, 12 \rangle$.

Solution. First we observe that the negative does not affect length.

$$\|\vec{u}\| =$$

Next we observe that the positive scalar scales the length of the vector.

$$\dots =$$

Next we compute the length $\|\vec{v}\| = \sqrt{\vec{v} \cdot \vec{v}}$ using dot products.

$$\dots =$$

A vector with length **1** is called a **unit vector**.