

MATH 10C: Calculus III (Lecture B00)

mathweb.ucsd.edu/~ynemish/teaching/10c

Today: Vectors in the plane

Next: Strang 2.2

Week 1:

- check the course website
- homework 1 (due Friday, September 30)
- join Piazza, Edfinity

Definition of a vector

We use scalars (numbers) to describe various quantities. Example: time, distance, mass, speed are represented by a single number (a scalar)

Certain quantities cannot be described by scalars. Think about the movement of an airplane. We need to know

the direction of the movement of the airplane
the speed of the airplane

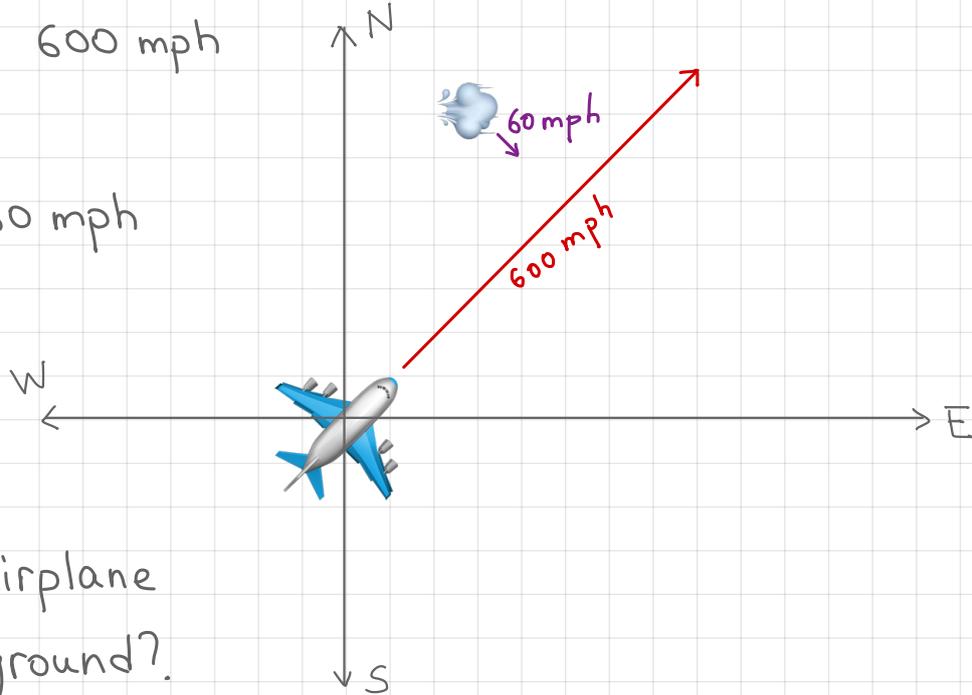
Def. A vector is a quantity that has both magnitude (size, length) and direction

Definition of a vector

Forces, displacements, velocity are described by vectors.

Airplane flies NE at 600 mph
(relative to the air)

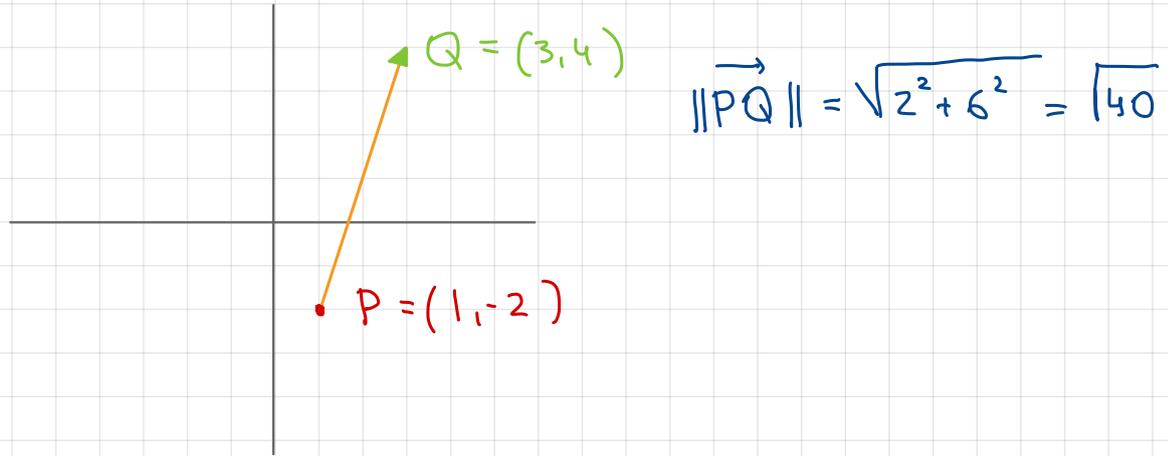
Wind blows SE at 60 mph



How fast does the airplane
fly relative to the ground?
In what direction?

Initial and terminal points. Magnitude

A vector in a plane is represented by a directed line segment from the **initial point** to the **terminal point**



The length of the line segment represents the magnitude of the vector

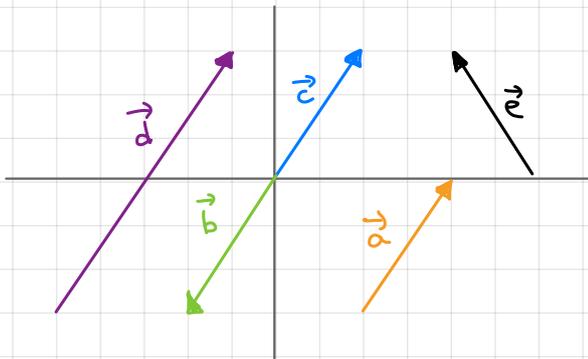
Notation: vectors are denoted $\vec{a}, \dots, \vec{v}, \vec{PQ}, \underline{v}, \checkmark$
the magnitude of the vector is denoted $\|\vec{v}\|, \|\vec{PQ}\|$

Zero vector. Equivalent vectors

A vector with an initial and terminal points that are the same is called the zero vector, denoted $\vec{0}$

We say that \vec{v} and \vec{w} are equivalent if they have the same direction and magnitude (denoted $\vec{v} = \vec{w}$)

We treat equivalent vectors as equal even if they have different initial points.



$$\vec{a} \neq \vec{b}$$

$$\vec{a} = \vec{c}$$

$$\vec{a} \neq \vec{d}$$

$$\vec{a} \neq \vec{e}$$