

Drop-In Sessions :

Wed 11:30 - 12:20

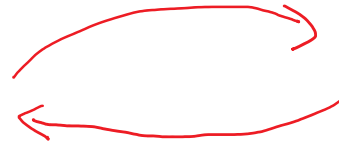
Wed 2:30 - 3:20

Fri 2:30 - 3:20

Matrix Algebra
Linear Algebra
Algebra and Geometry

Geometry

lines
planes
distance
angle



Algebra

formulas
higher dimensions

Ex: Tracking an object's 3D position over time
4 variables
4D problem

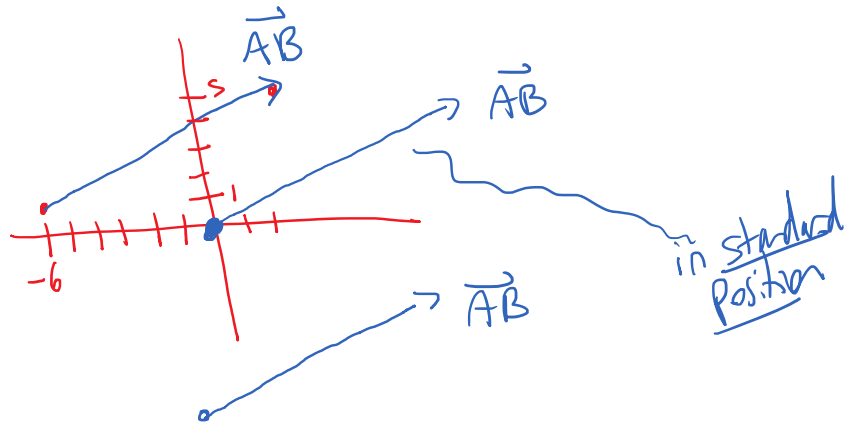
Vector: line segment with direction

Vector: line segment with direction

Ex: $A = (-6, 1)$ $B = (2, 5)$

Calculate \vec{AB}

$$\vec{AB} = [8, 4] \quad \text{Think } B - A$$



Notation:

$[1, 2]$: vector

$(1, 2)$: point

a, b, c : real number / constant / scalar

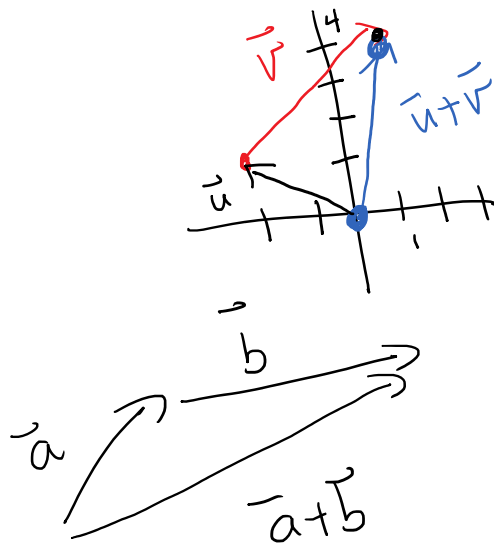
$\vec{u}, \vec{v}, \vec{c}$: vector

$\mathbf{a}, \mathbf{u}, \mathbf{c}$: textbook version of vectors

Ex: Geometry / algebra of $\vec{u} + \vec{v}$

$$\vec{u} = [-2, 1] \quad \vec{v} = [3, 3]$$

$$\vec{u} + \vec{v} = [1, 4]$$

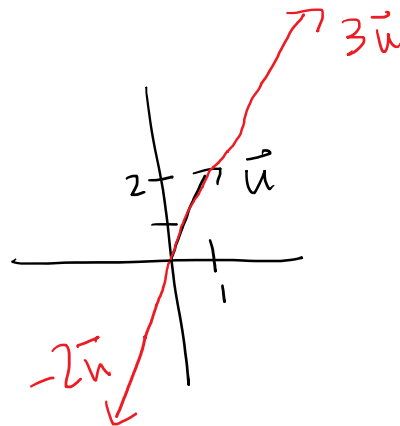


Ex: Scalar Multiplication $c\vec{u}$

$$\vec{u} = [1, 2]$$

$$3\vec{u} = [3, 6]$$

$$-2\vec{u} = [-2, -4]$$

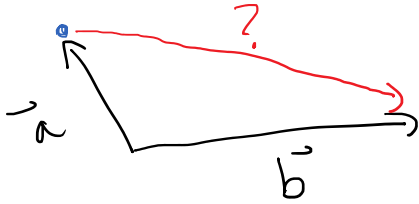


$\vec{u}, 3\vec{u}, -2\vec{u}$ are all parallel

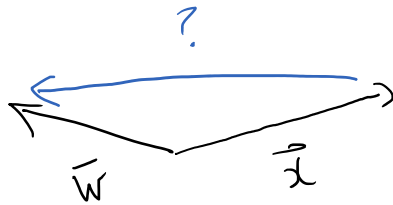
Ex: Geometry / algebra of $\vec{u} - \vec{v}$

$$\vec{u} = [1, 8] \quad \vec{v} = [2, 5]$$

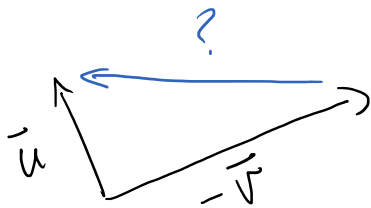
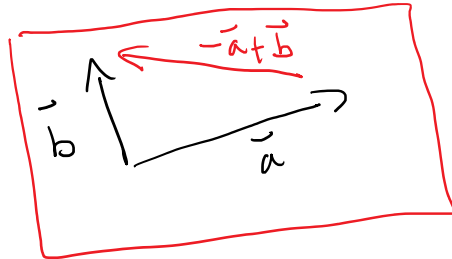
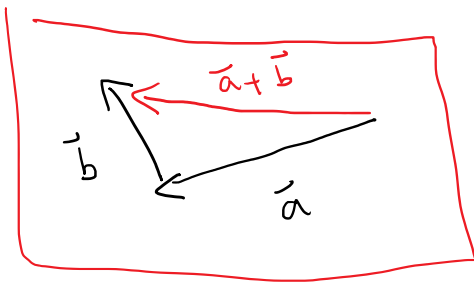
$$\vec{u} - \vec{v} = [-1, 3]$$



$$\begin{aligned} ? &= -\vec{a} + \vec{b} \\ &= \vec{b} - \vec{a} \end{aligned}$$



$$\begin{aligned} ? &= -\vec{x} + \vec{w} \\ &= \vec{w} - \vec{x} \end{aligned}$$



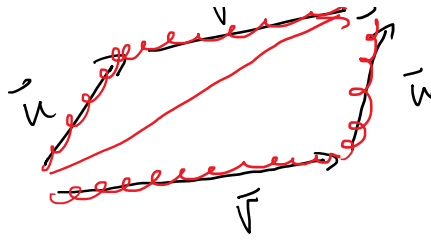
$$\begin{aligned} ? &= \vec{v} + \vec{u} \\ &= \vec{u} + \vec{v} \end{aligned}$$

FACT

$$\vec{u} + \vec{v} = \vec{v} + \vec{u}$$

for all vectors \vec{u}, \vec{v}





Ex:

1.1 #21

Write \vec{w} as a linear combination of \vec{u} and \vec{v}

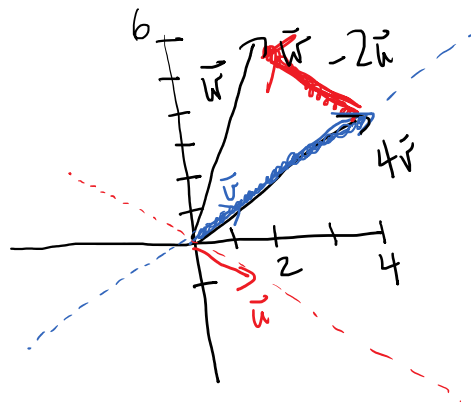
$$\vec{u} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}, \quad \vec{v} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \quad \vec{w} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$$

$$\vec{w} = c_1 \vec{u} + c_2 \vec{v}$$

lin. com.

Algebra
(Ch. 2)

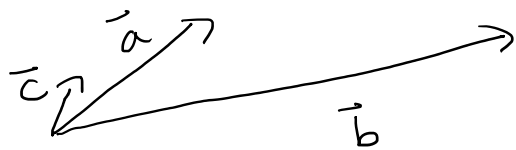
Geometry
easier



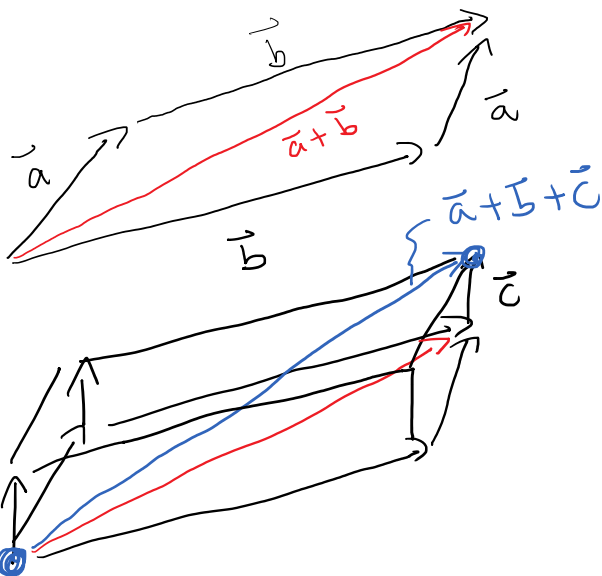
$$\vec{w} = 4\vec{v} - 2\vec{u}$$

$$\boxed{\vec{w} = -2\vec{u} + 4\vec{v}}$$

Ex:



Draw $\vec{a} + \vec{b} + \vec{c}$



Ex: $[1, 2] + [3, 4, 7]$
is undefined (in this course)
