MATH_20C_Lecture_1

Goal: Start 12.1 : Vectors in the plane

next 12.1

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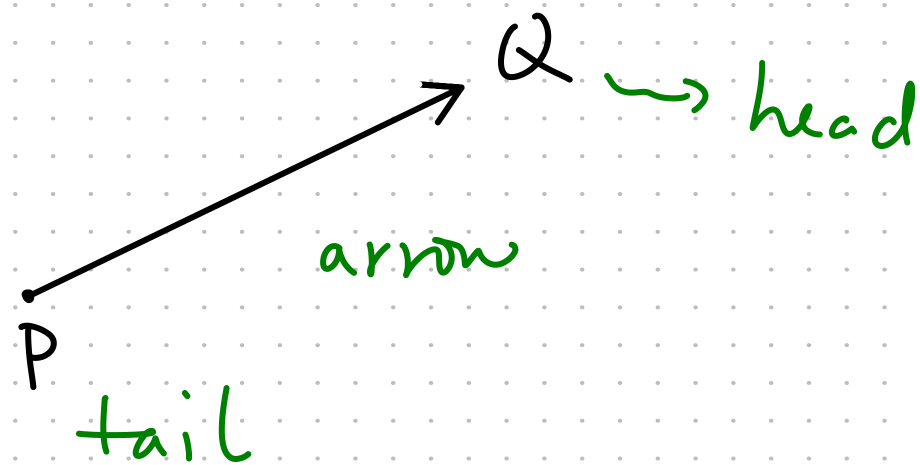
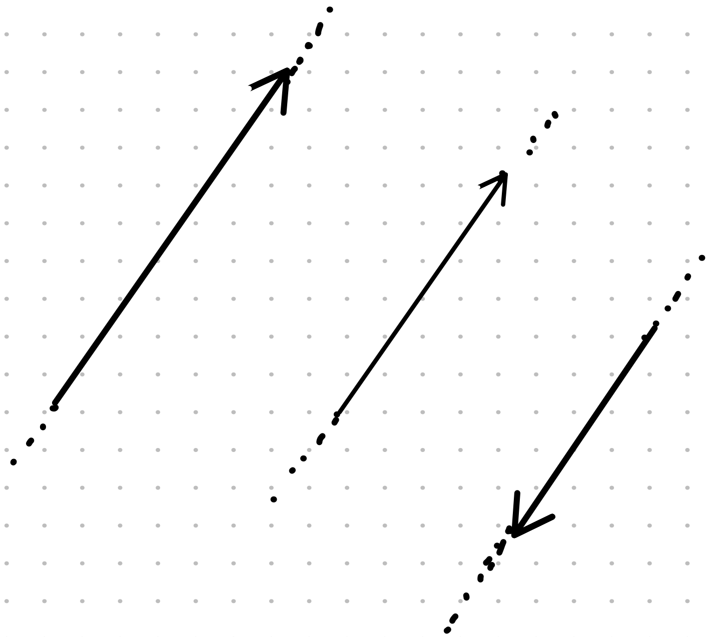
vectors :



notation : $\mathbf{v} = \overrightarrow{PQ}$ or $\vec{v} = \overrightarrow{PQ}$

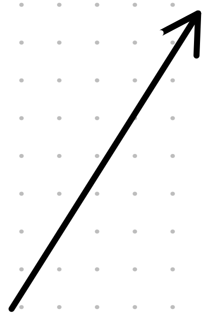
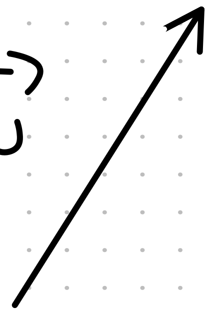
the arrow has length and direction

$\|\vec{v}\|$



· parallel vectors

(assume they are not zero vector)

· $\vec{v}$  $\vec{w}$ 

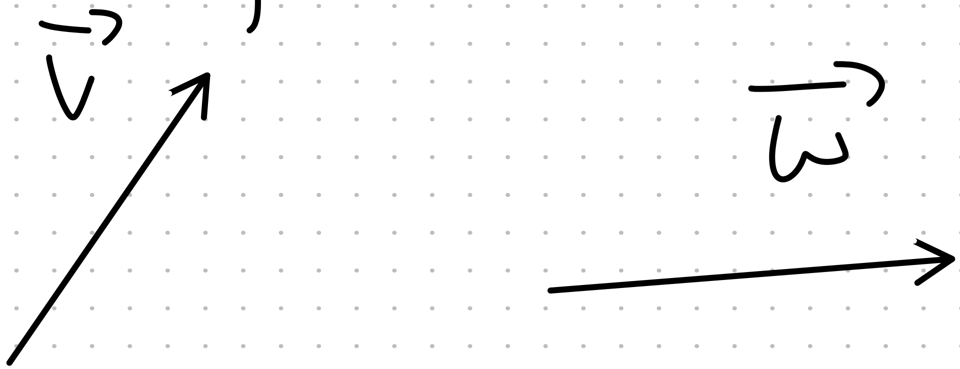
$\vec{w}$ is a translation of $\vec{v}$

They have the same length and direction

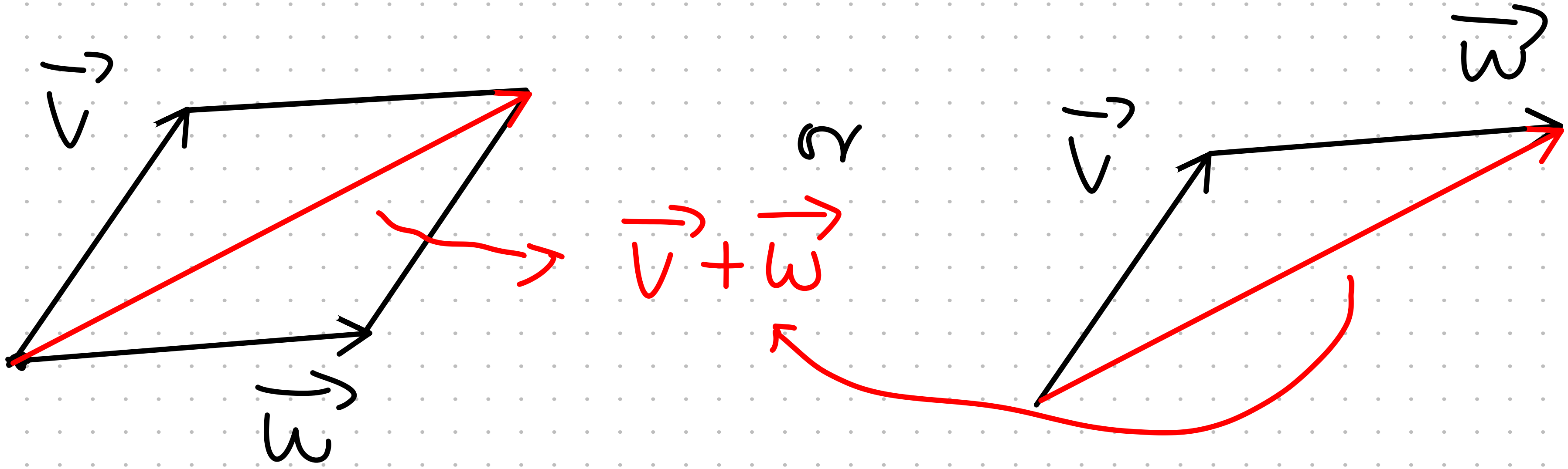
$\Rightarrow$ we say $\vec{v}$ and $\vec{w}$ are equivalent

In this course, we consider $\vec{v}$ and $\vec{w}$ the same.

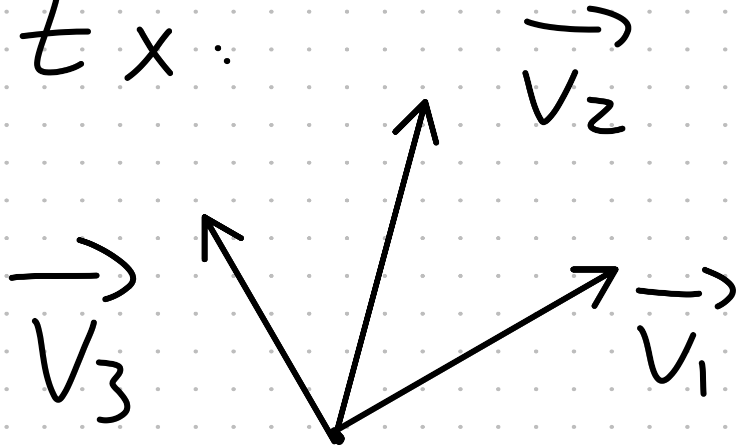
Vector operations

1. 

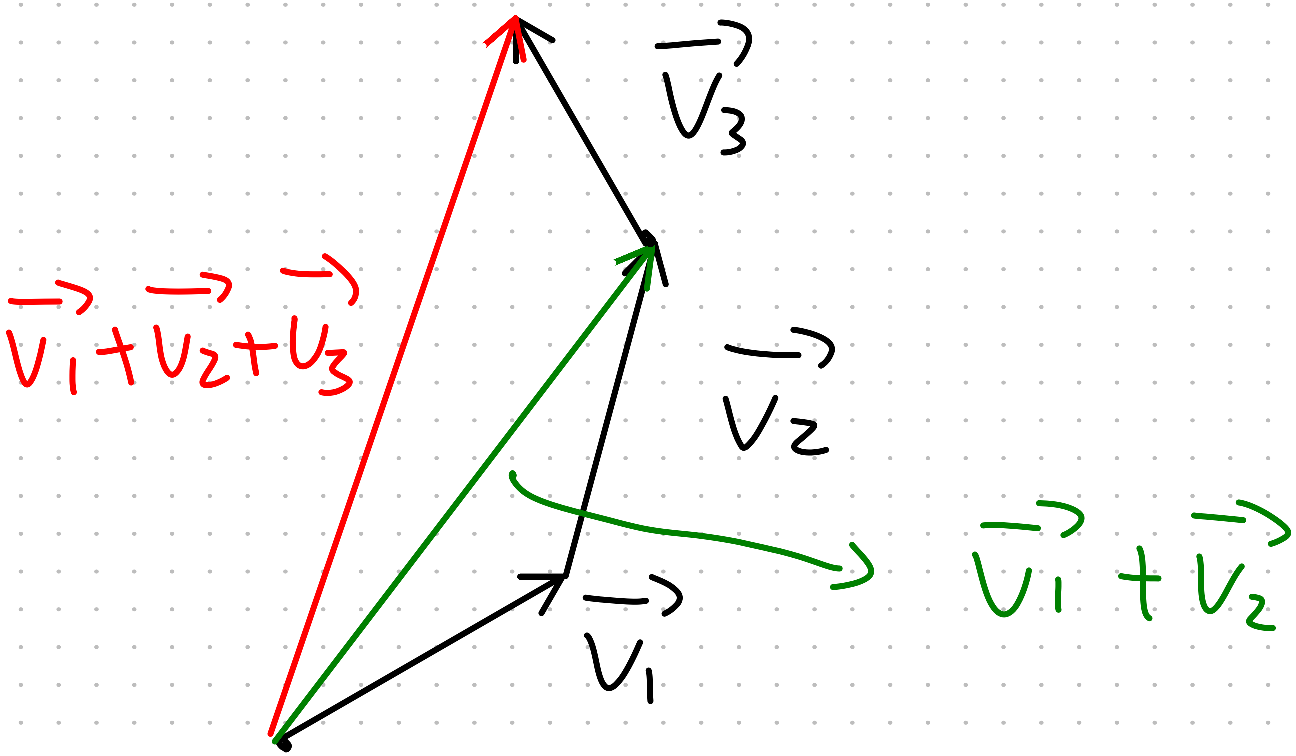
define $\vec{v}+\vec{w}$ by



Ex:



$$\vec{v_1} + \vec{v_2} + \vec{v_3}$$
$$= (\vec{v_1} + \vec{v_2}) + \vec{v_3}$$

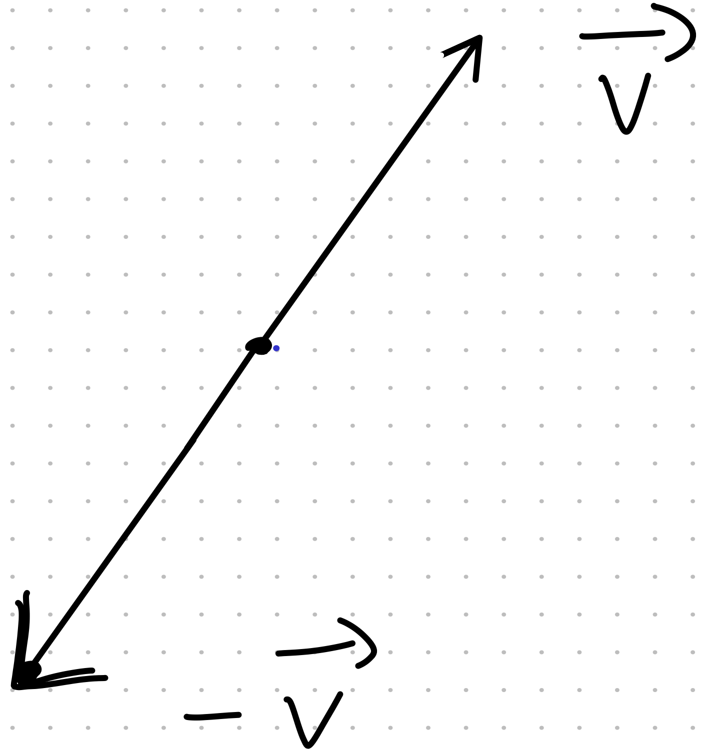


Exercise: draw

$$\vec{v}_1+\vec{v}_3+\vec{v}_2=(\vec{v}_1+\vec{v}_3)+\vec{v}_2$$

show it gives the same answer.

2.



same length, opposite direction.

$$\vec{v} + (-\vec{v}) = \vec{0}$$

zero vector.

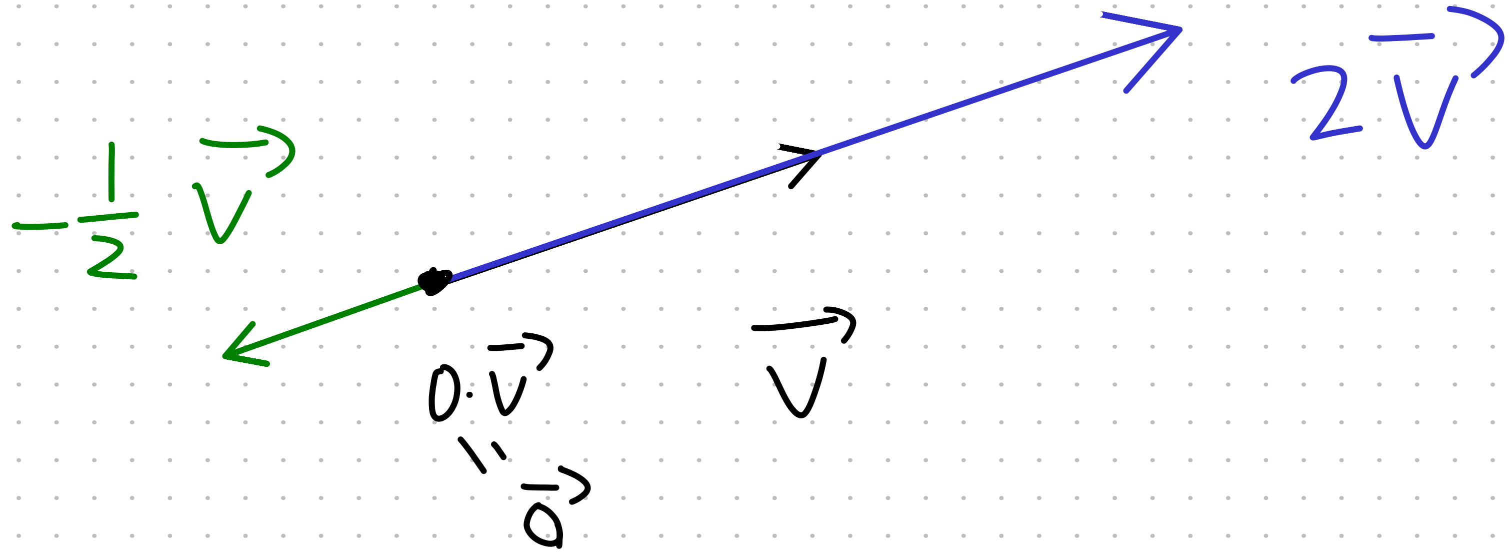
verify.

3. λ real number / scalar

$\vec{v}$ vector.

scalar multiplication $\lambda \vec{v}$

is defined by



Note that $\lambda \vec{v}$ is parallel to $\vec{v}$

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properties of scalar multiplication:

1. $\| \lambda \vec{v} \| = |\lambda| \, \| \vec{v} \|$

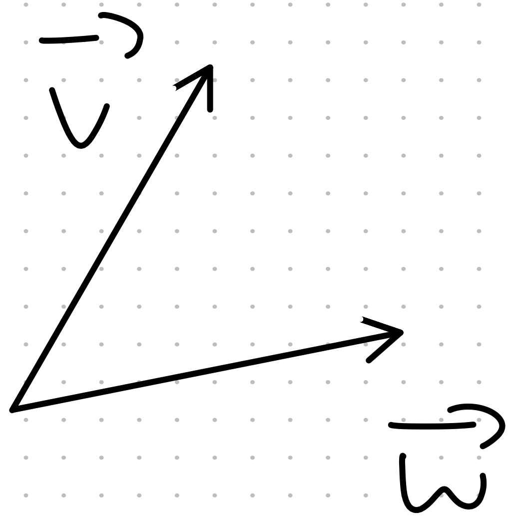
2. $\lambda \vec{v}$ points in the same direction as $\vec{v}$ if $\lambda > 0$

$\lambda \vec{v}$ points in the opposite direction to $\vec{v}$ if $\lambda < 0$

3. $0\vec{v} = \vec{0}$

4. $(-1)\vec{v} = -\vec{v}$

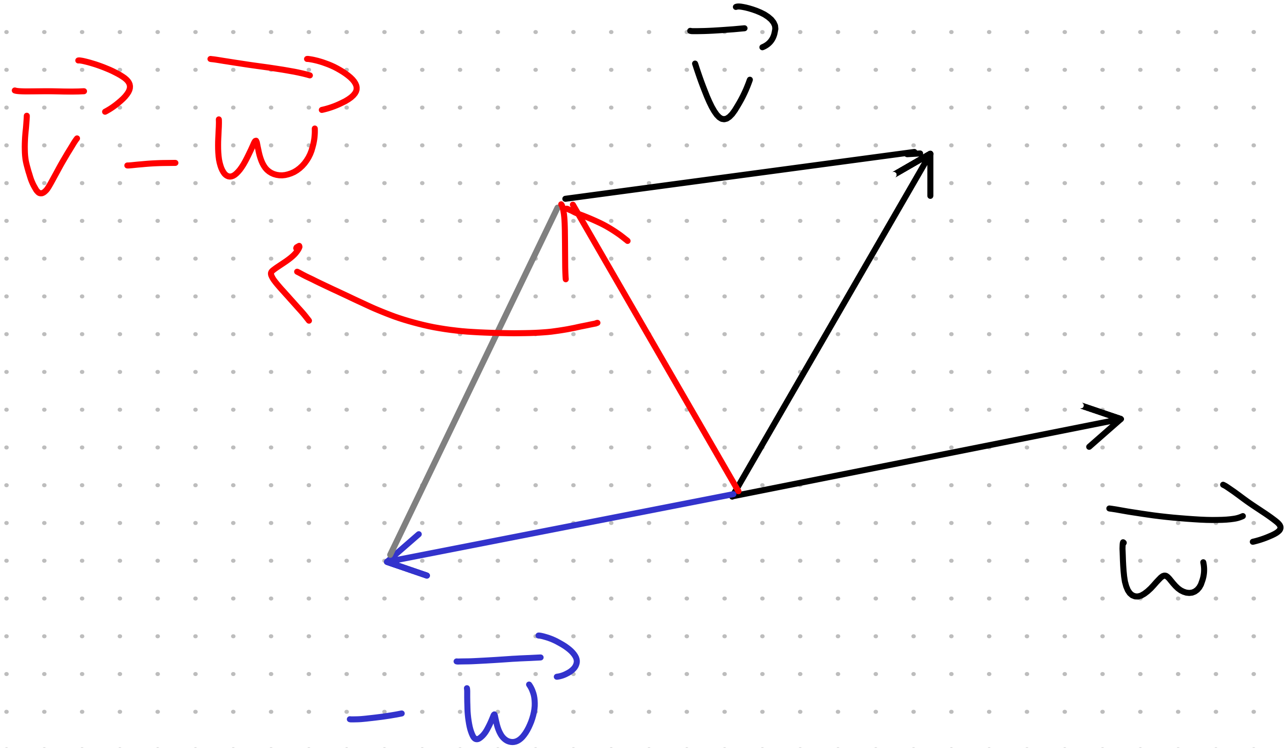
computa

Ex. 

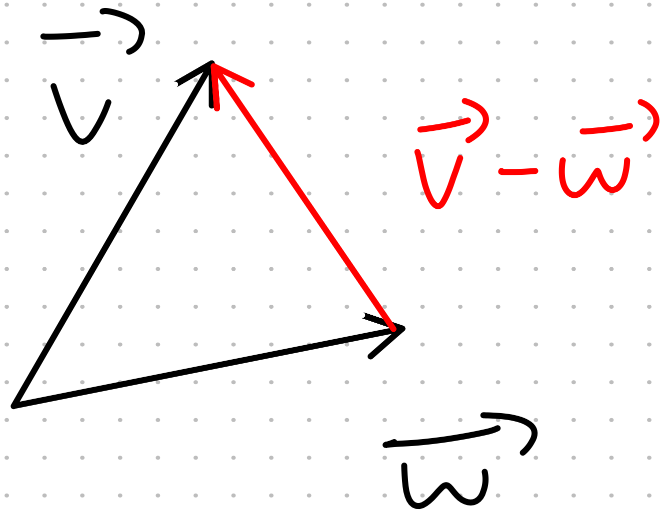
vector substraction

$\vec{v} - \vec{w}$

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



or



this shows

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