

Exercise walk-through

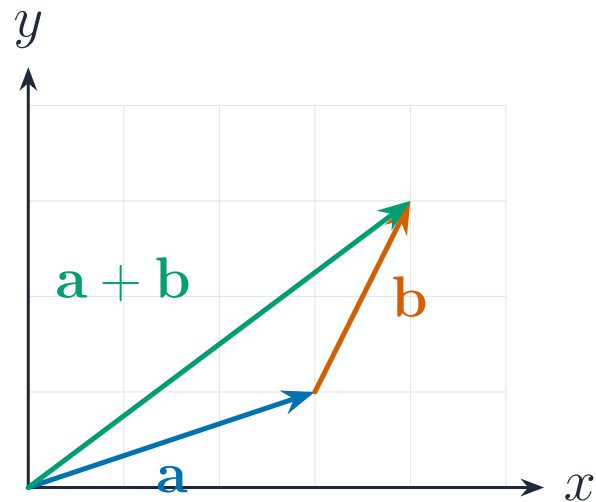
4.9

Vector-Valued Functions

AP Precalculus

What we will cover

- 1 Parametric functions
- 2 Planar motion & rates
- 3 Circles lines & conics
- 4 Implicit curves
- 5 Vectors
- 6 Matrices & determinants
- 7 Linear transformations

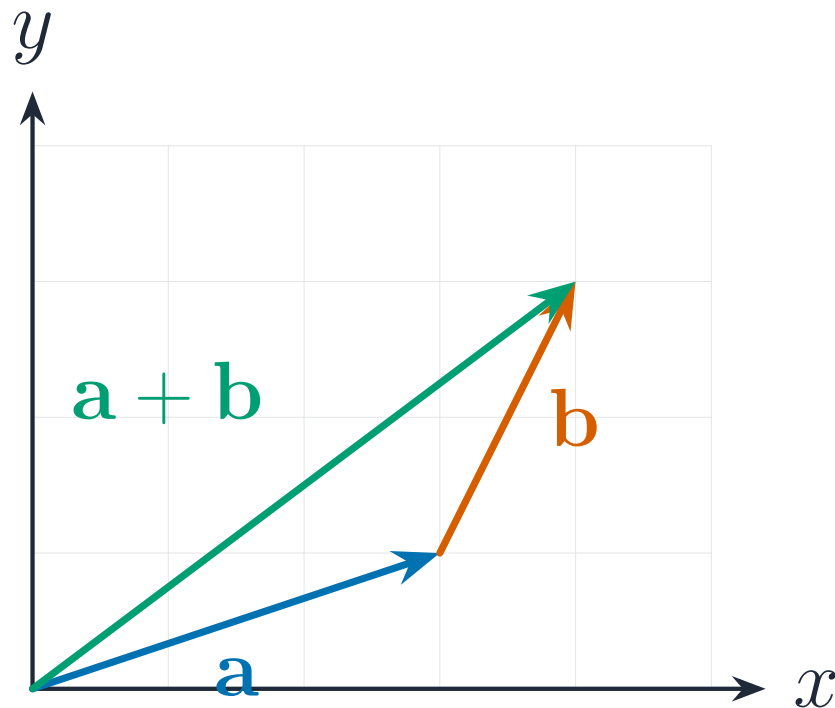


Vectors

A **vector** has **magnitude** and **direction**, written $\langle a, b \rangle$:

$$|\vec{v}| = \sqrt{a^2 + b^2}, \quad \theta = \arctan \frac{b}{a}.$$

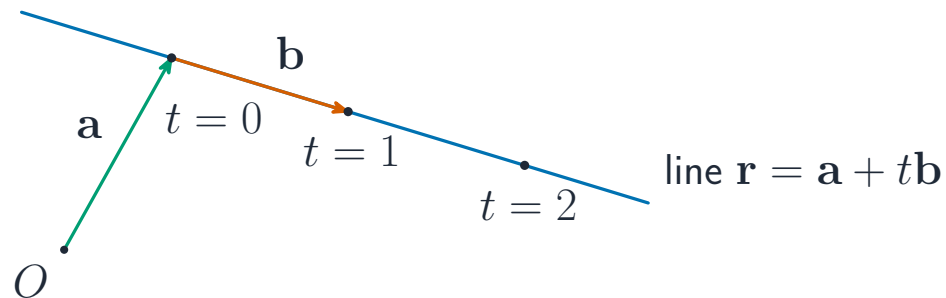
Add **component-wise**; a **scalar** multiple $k\vec{v}$ scales the length (and flips it if $k < 0$).



Vector-valued functions

A vector-valued function

$\vec{p}(t) = \langle x(t), y(t) \rangle$ is a **position vector** for each t – the same idea as a parametric function, written as one object.



A line: start at $\vec{a}$, then slide t lots of the direction $\vec{b}$ – $\vec{p}(t) = \vec{a} + t\vec{b}$.

Exercises 2.1·2.3

2.1 State what $\vec{r}(t) = \langle x(t), y(t) \rangle$ gives. [1]

2.2 For $\vec{r}(t) = \langle 2t, t \rangle$, find $\vec{r}(3)$. [2]

2.3 State the connection between vector-valued and parametric functions. [1]

Exercises 2.1·2.3

2.1 State what $\vec{r}(t) = \langle x(t), y(t) \rangle$ gives. [1]

2.1

- a position vector for each value of t
-

2.2 For $\vec{r}(t) = \langle 2t, t \rangle$, find $\vec{r}(3)$. [2]

2.2

- $\vec{r}(3) = \langle 6, 3 \rangle$
-

2.3 State the connection between vector-valued and parametric functions. [1]

2.3

- they carry the same information – the components $x(t)$, $y(t)$ are the parametric equations

Exercises 3.1·3.2

3.1 A vector-valued function $\vec{r}(t) = \langle x(t), y(t) \rangle$ describes

[1]

☐

A a single number

B a position vector at each t

C a slope

D an area

3.2 For $\vec{r}(t) = \langle t, 2t \rangle$, $\vec{r}(1)$ equals

[1]

☐

A $\langle 1, 2 \rangle$

B $\langle 2, 1 \rangle$

C $\langle 1, 1 \rangle$

D $\langle 2, 2 \rangle$

Exercises 3.1·3.2

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3.1 B

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[1]

☐

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B $\langle 2, 1 \rangle$

C $\langle 1, 1 \rangle$

D $\langle 2, 2 \rangle$

3.2 A

- $\langle 1, 2 \rangle$.

Exercise 3.3 (a)

3.3 $\vec{r}(t) = \langle t + 1, 3t \rangle$.

(a) Find $\vec{r}(0)$.

[1]

Exercise 3.3 (a)

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(a) Find $\vec{r}(0)$.

[1]

(a)

- $\langle 1, 0 \rangle$

Exercise 3.3 (b)

3.3 $\vec{r}(t) = \langle t + 1, 3t \rangle$.

(b) Find $\vec{r}(2)$.

[1]

Exercise 3.3 (b)

3.3 $\vec{r}(t) = \langle t + 1, 3t \rangle$.

(b) Find $\vec{r}(2)$.

[1]

(b)

- $\langle 3, 6 \rangle$

Exercise 3.3 (c)

3.3 $\vec{r}(t) = \langle t + 1, 3t \rangle$.

(c) State the x -component function.

[1]

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3.3 $\vec{r}(t) = \langle t + 1, 3t \rangle$.

(c) State the x -component function.

[1]

(c)

- $x(t) = t + 1$