Linear Algebra and Geometry 1

Systems of equations, matrices, vectors, and geometry

Vectors

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MiTM
Man in The Middle AB

an object having both direction and magnitude

an object having both direction and magnitude

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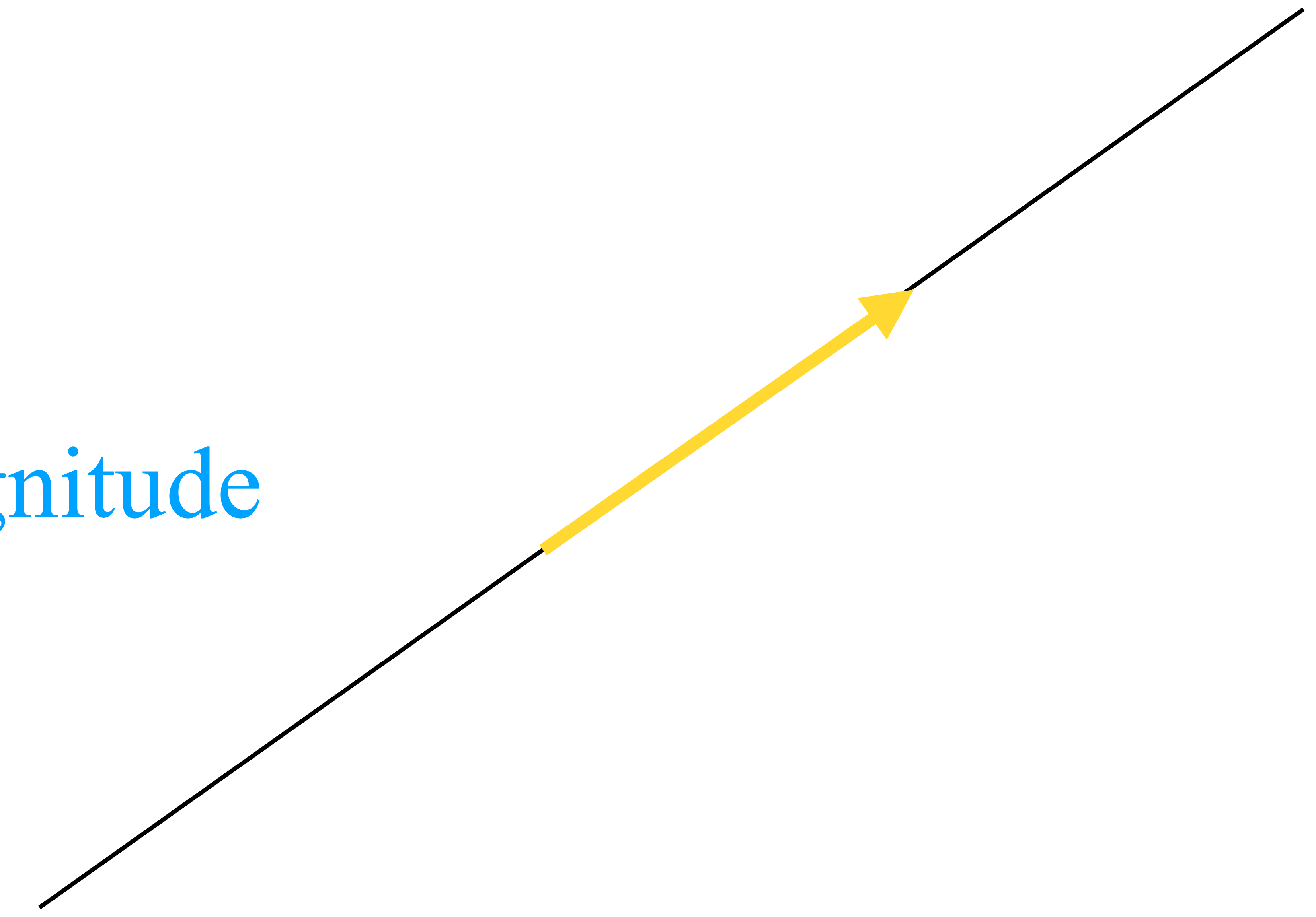
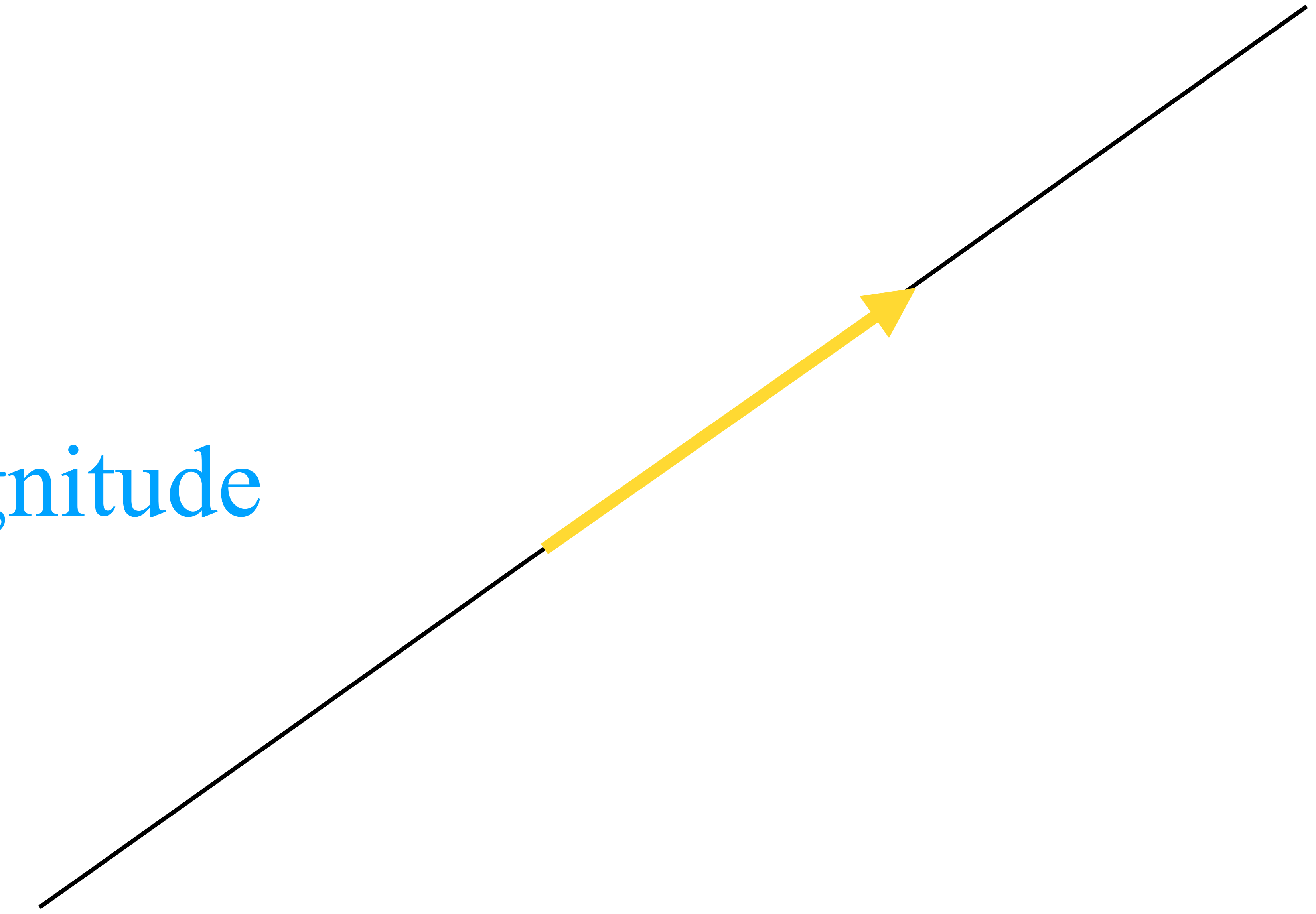
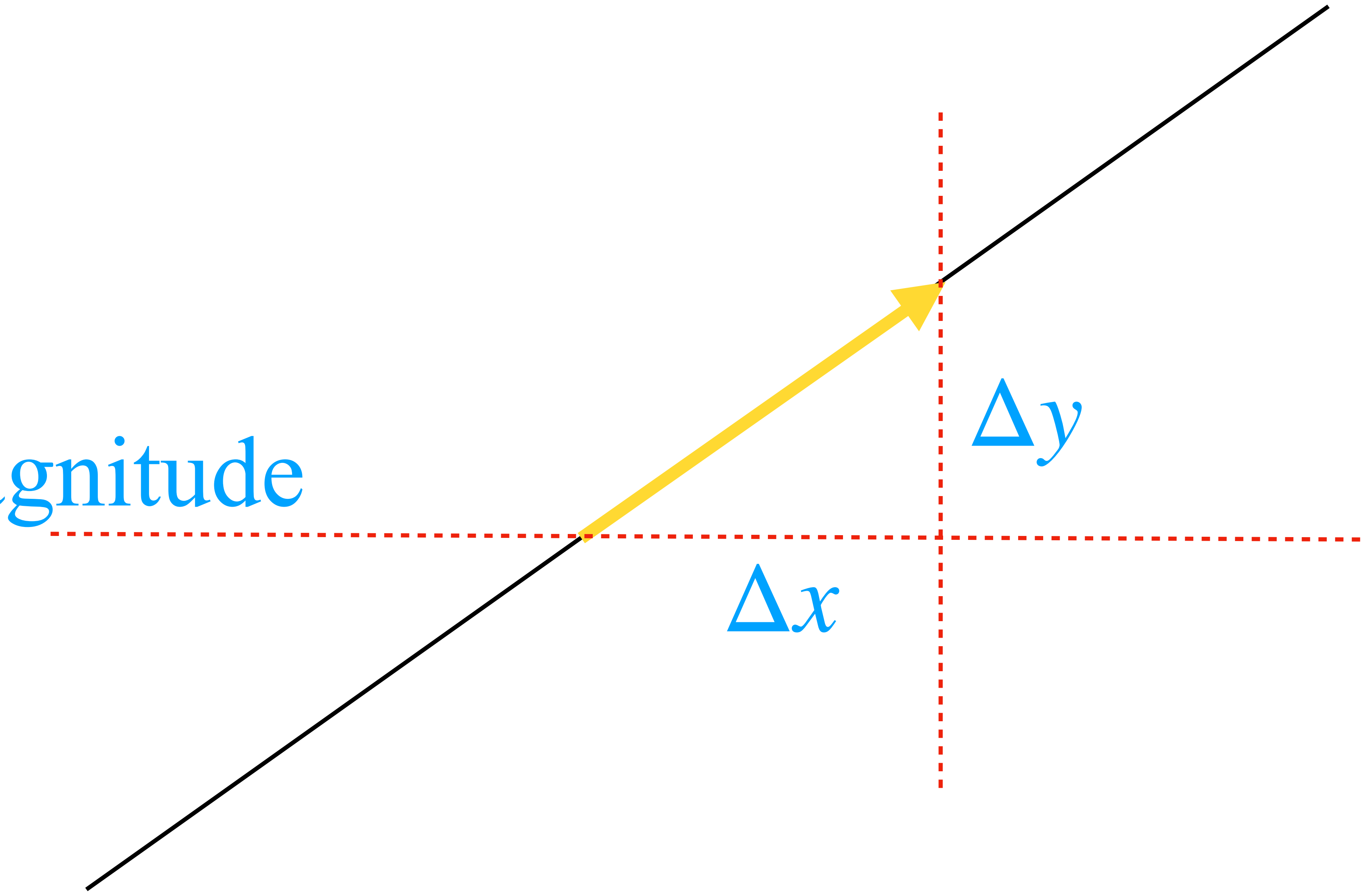


an object having both direction and magnitude



measure of displacement: Δx, Δy in the plane; Δx, Δy, Δz in the 3-space

an object having both direction and magnitude



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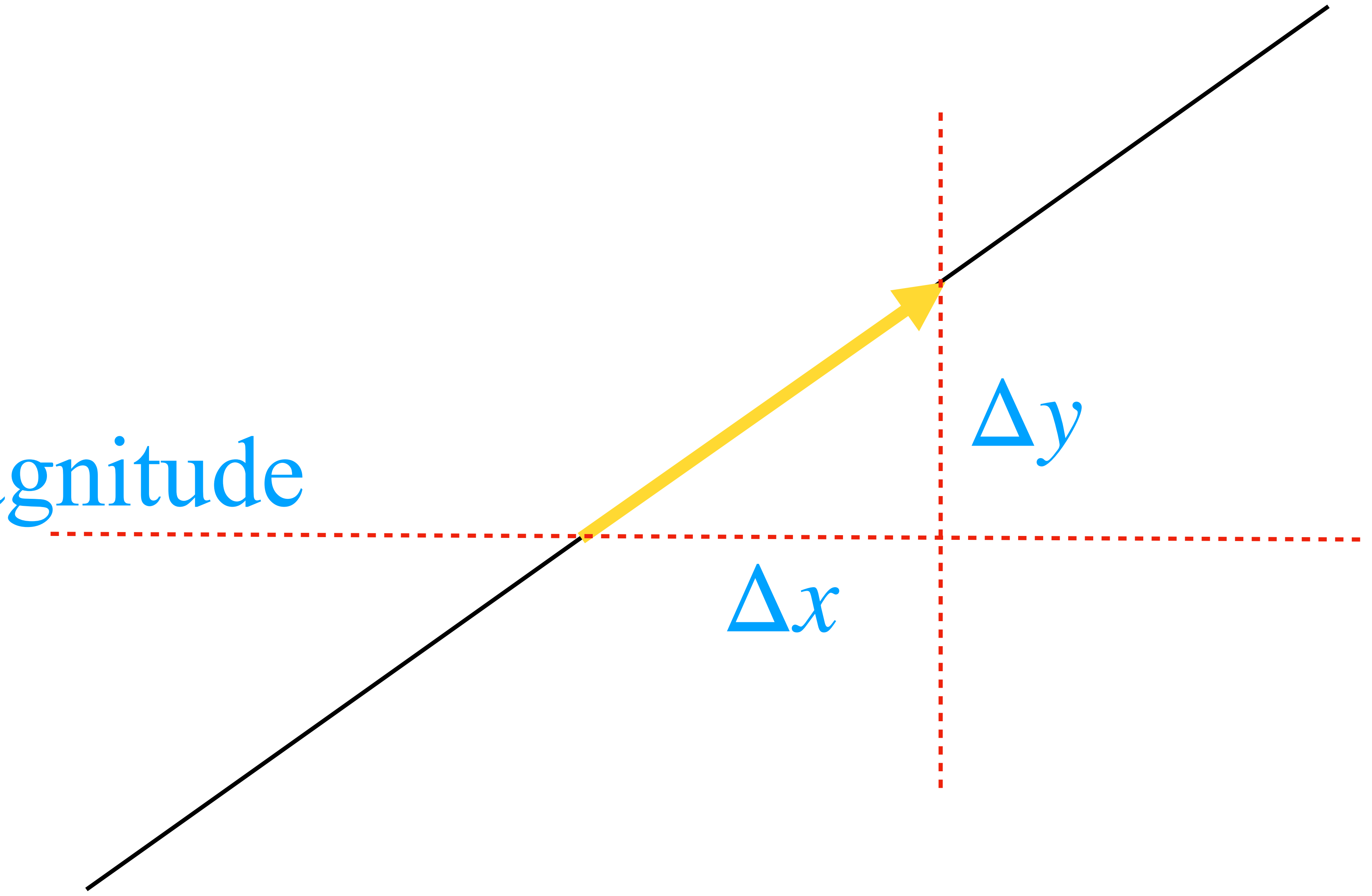
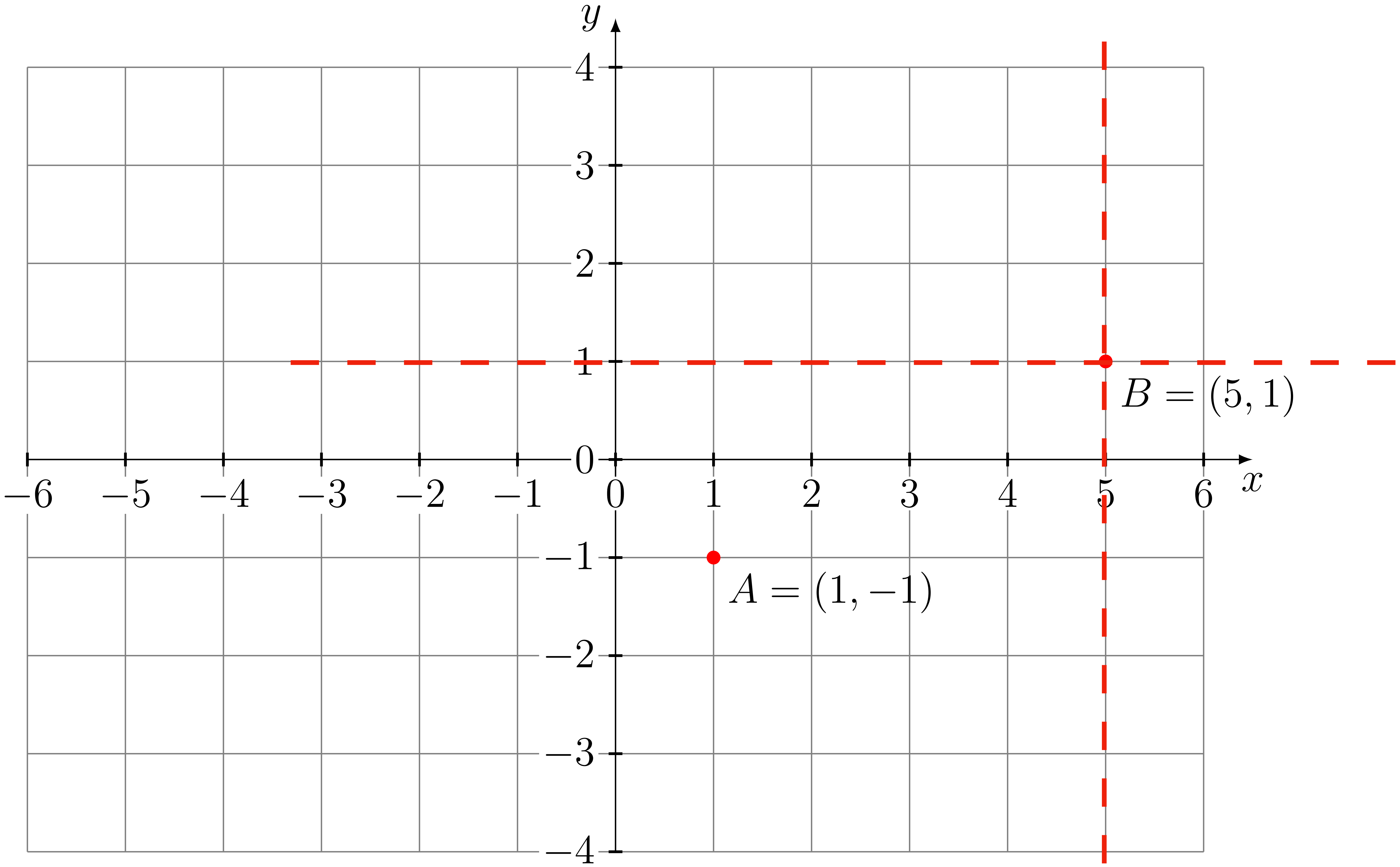


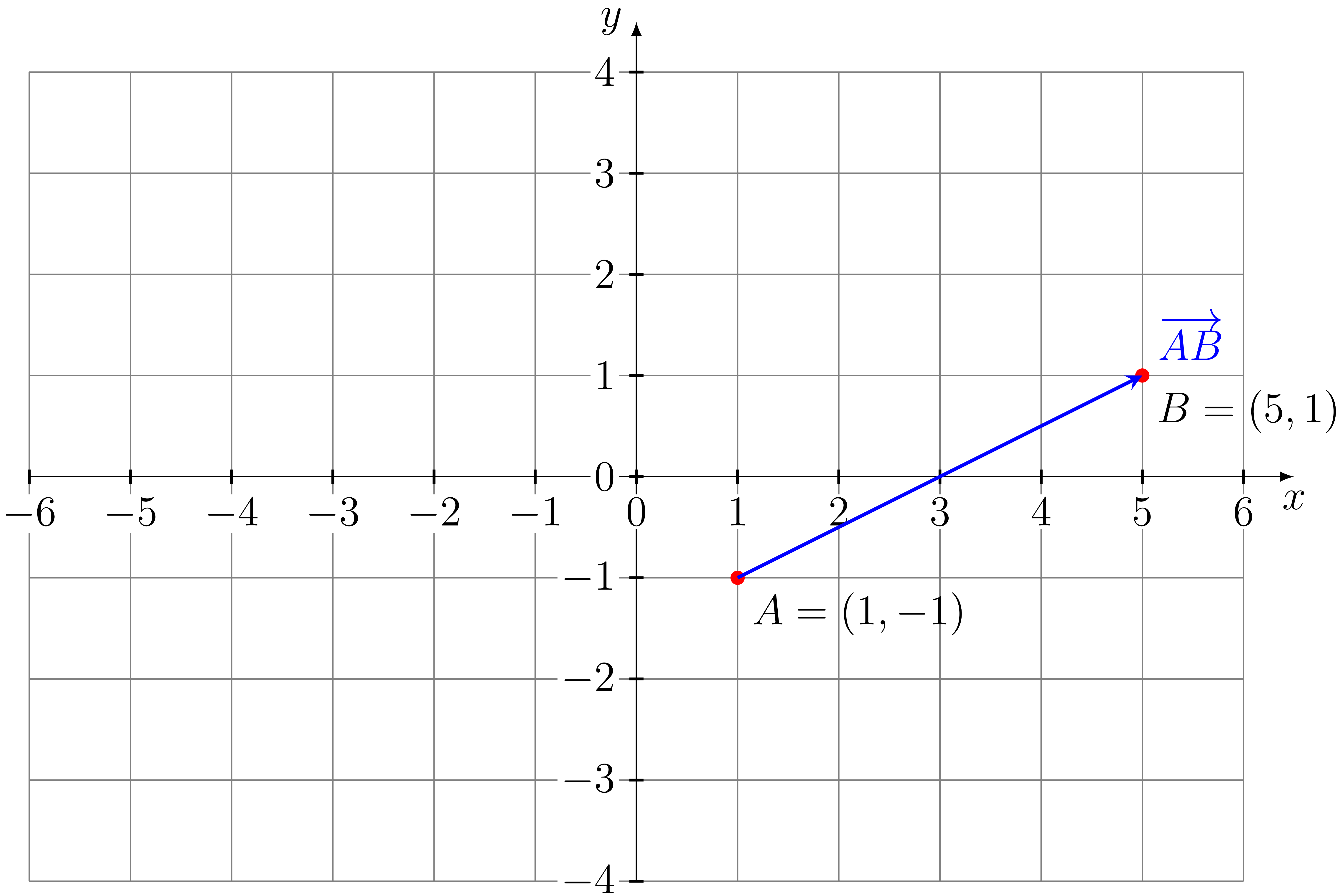
measure of displacement: Δx, Δy in the plane; Δx, Δy, Δz in the 3-space

a list of numbers: (v_1, v_2) or (v_1, v_2, v_3) or $(v_1, v_2, \ldots, v_n)$

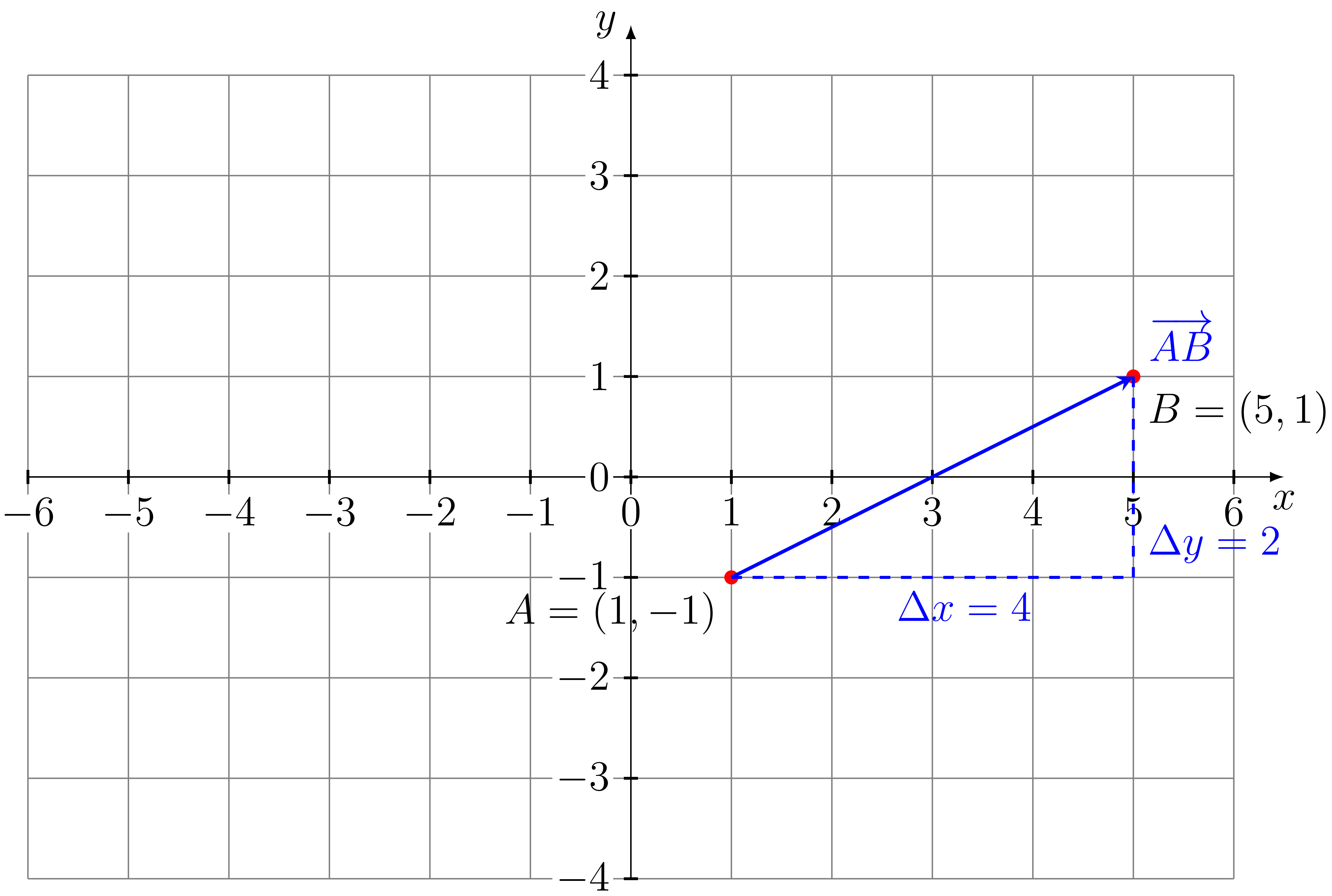
Cartesian coordinate system



Vectors



Change in x and change in y

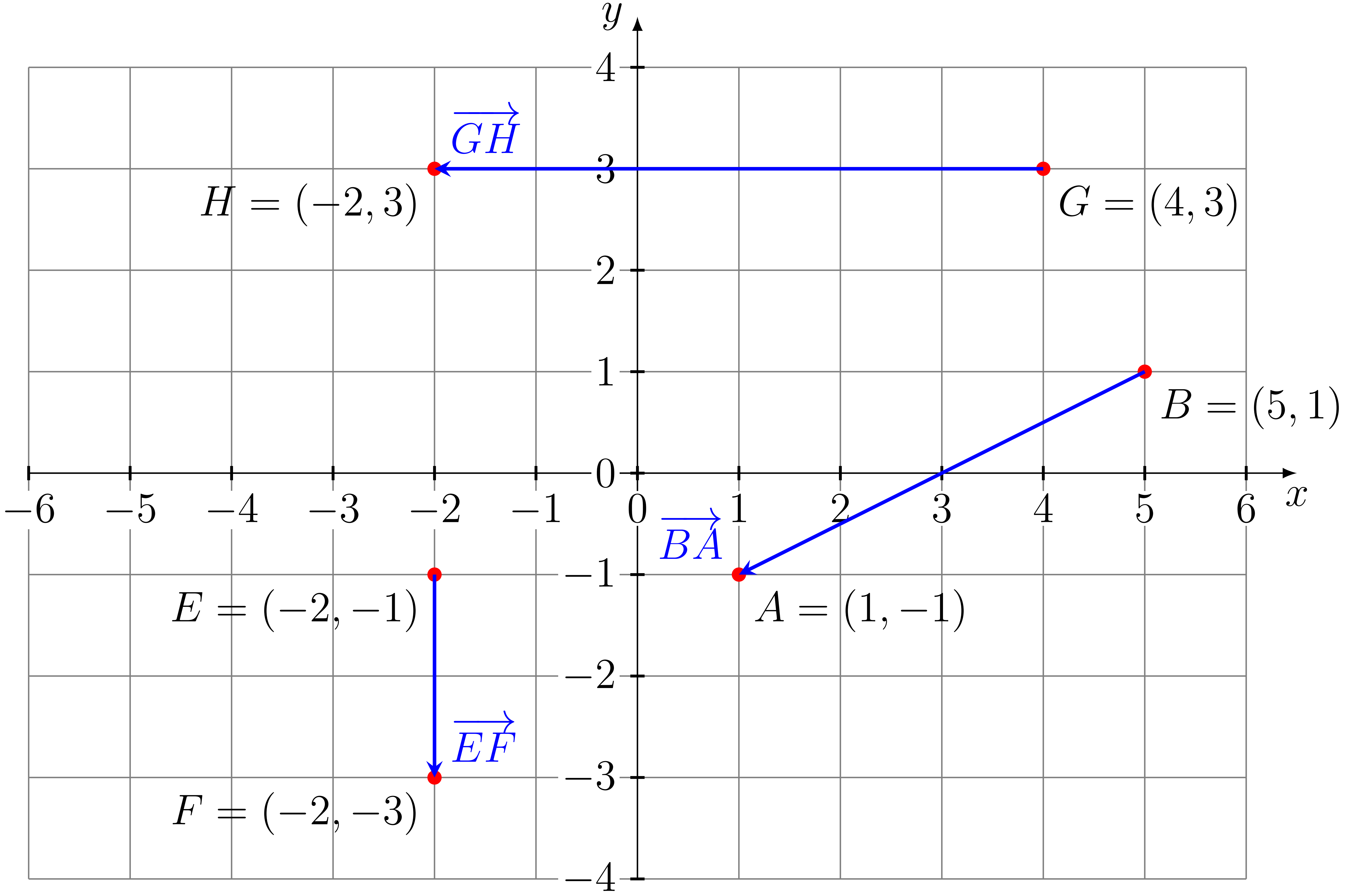


coordinates

components

$$\overrightarrow{AB} = (5, 1) - (1, -1) = (5 - 1, 1 - (-1)) = (4, 2)$$

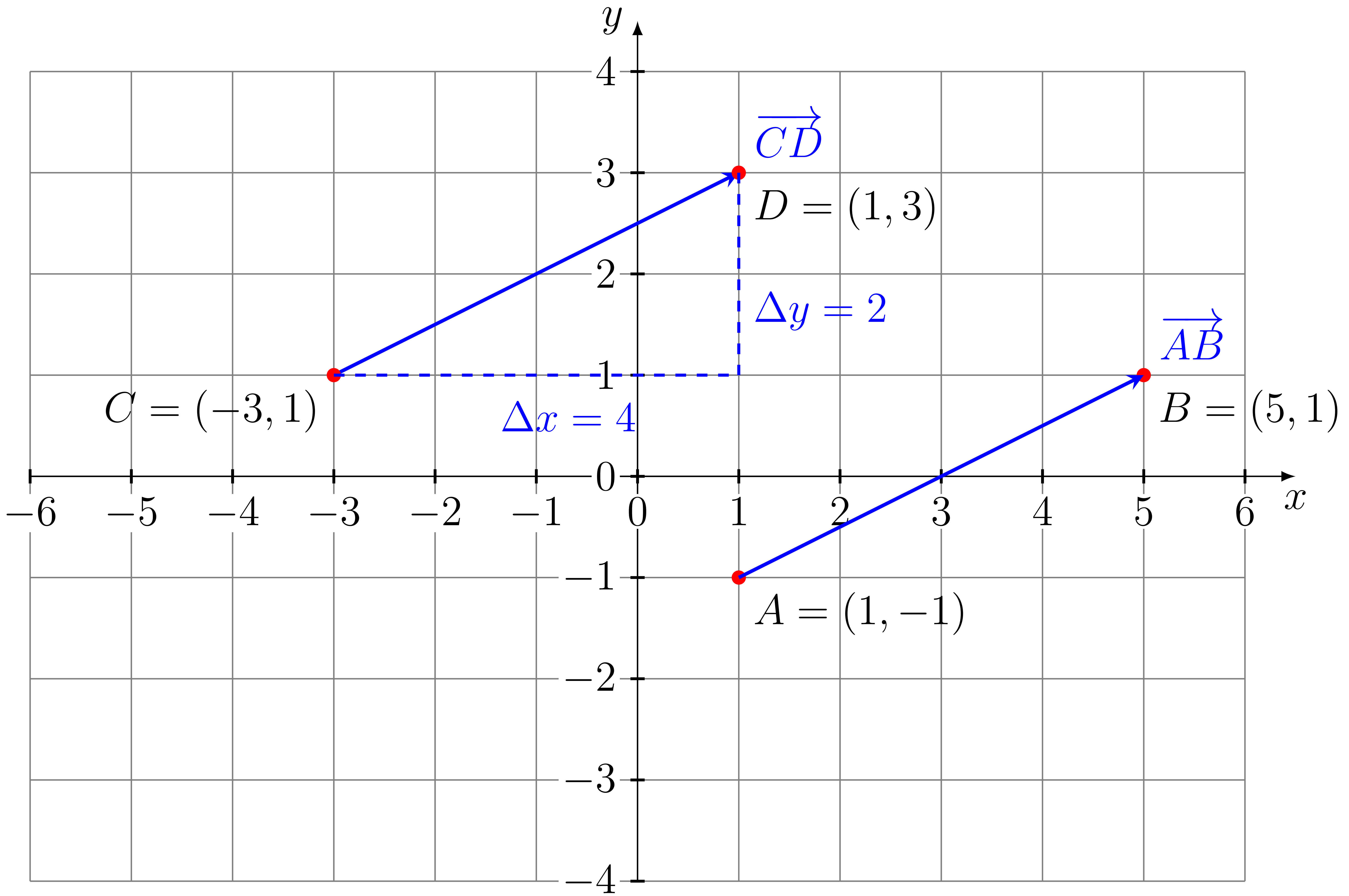
$$\overrightarrow{GH} = (-6, 0)$$



$$\overrightarrow{EF} = (0, -2)$$

$$\overrightarrow{BA} = (-4, -2) = -\overrightarrow{AB}$$

Identification of vectors with the same coordinates



$$\overrightarrow{CD} = (1, 3) - (-3, 1) = (1 - (-3), 3 - 1) = (4, 2)$$

Notation

$$\overrightarrow{v} = (v_1, v_2) \qquad \mathbf{v} = (v_1, v_2)$$

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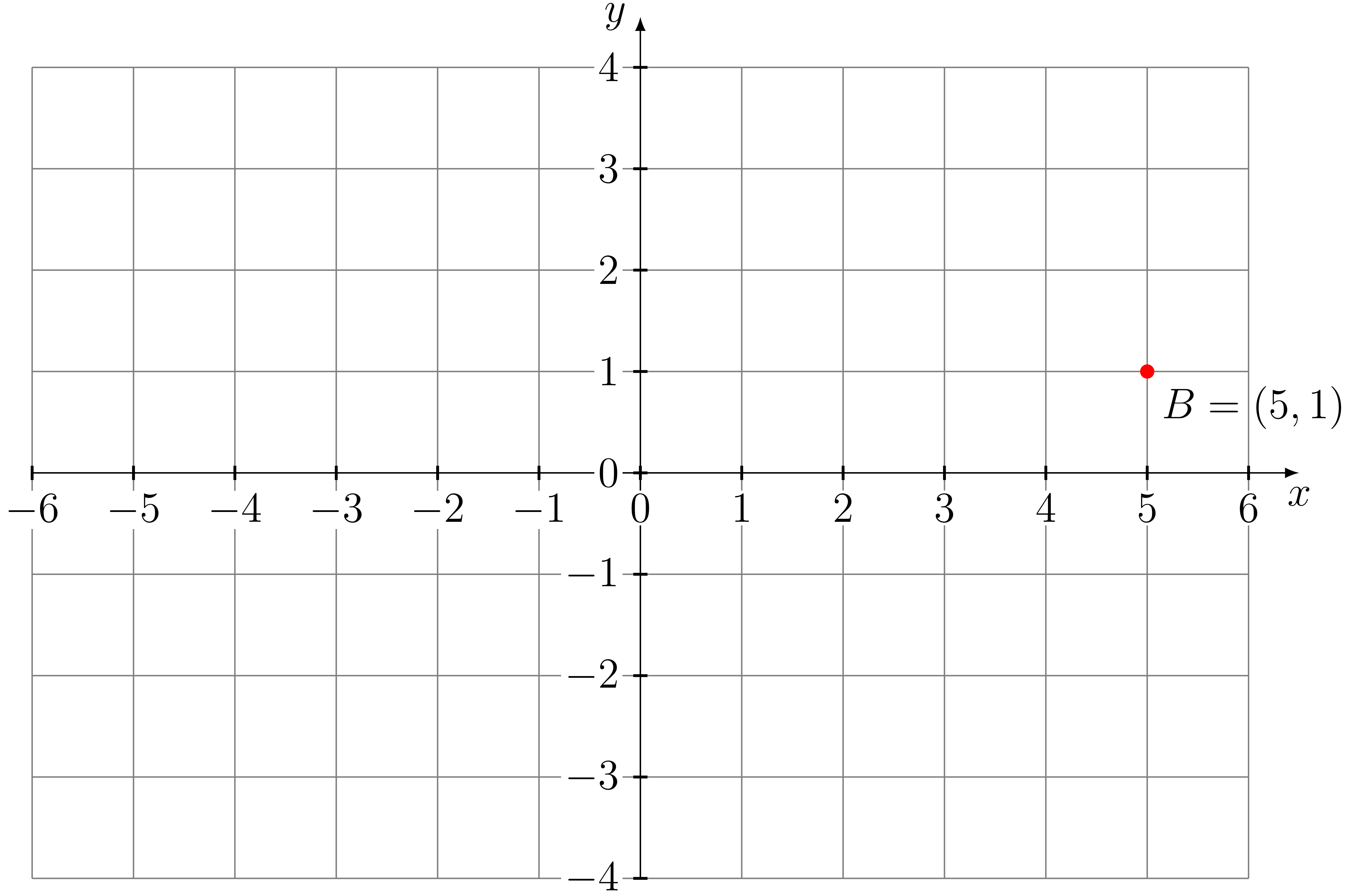
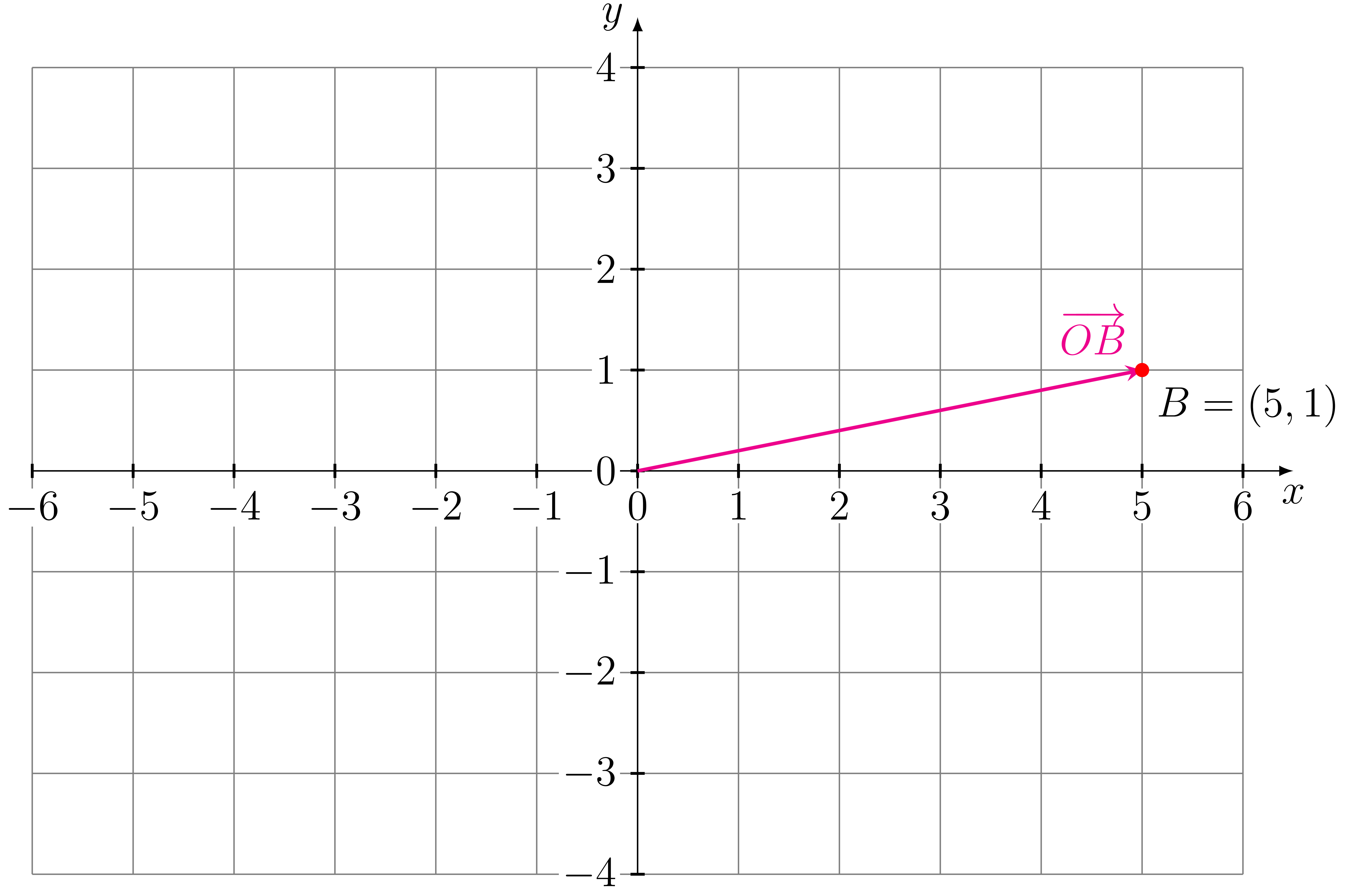
$$\overrightarrow{v} = (v_1, v_2, v_3) \qquad \mathbf{v} = (v_1, v_2, v_3)$$

Identification of points and position vectors



Identification of points and position vectors



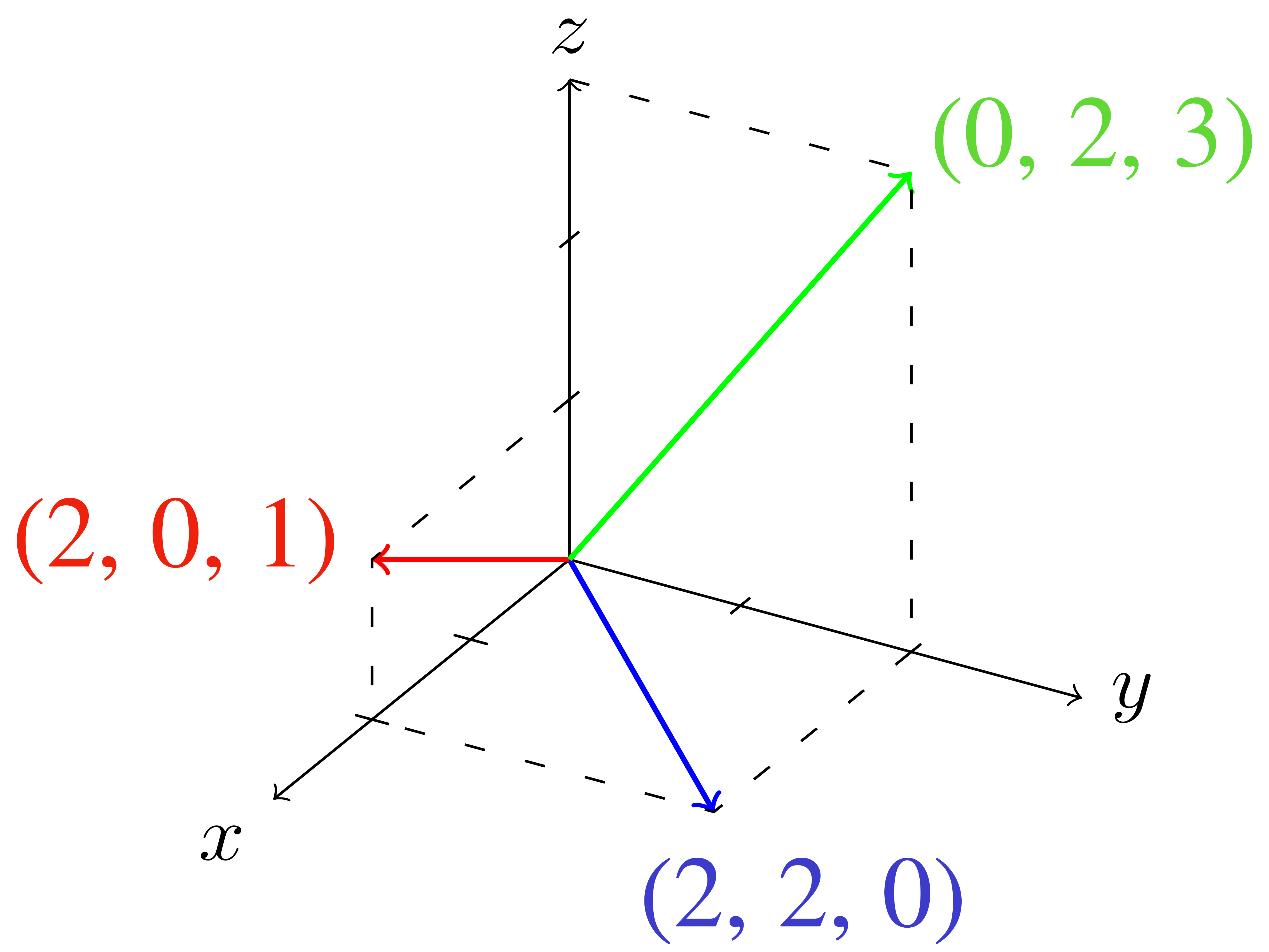
Notation

$$\overrightarrow{v} = (v_1, v_2) \qquad \mathbf{v} = (v_1, v_2)$$

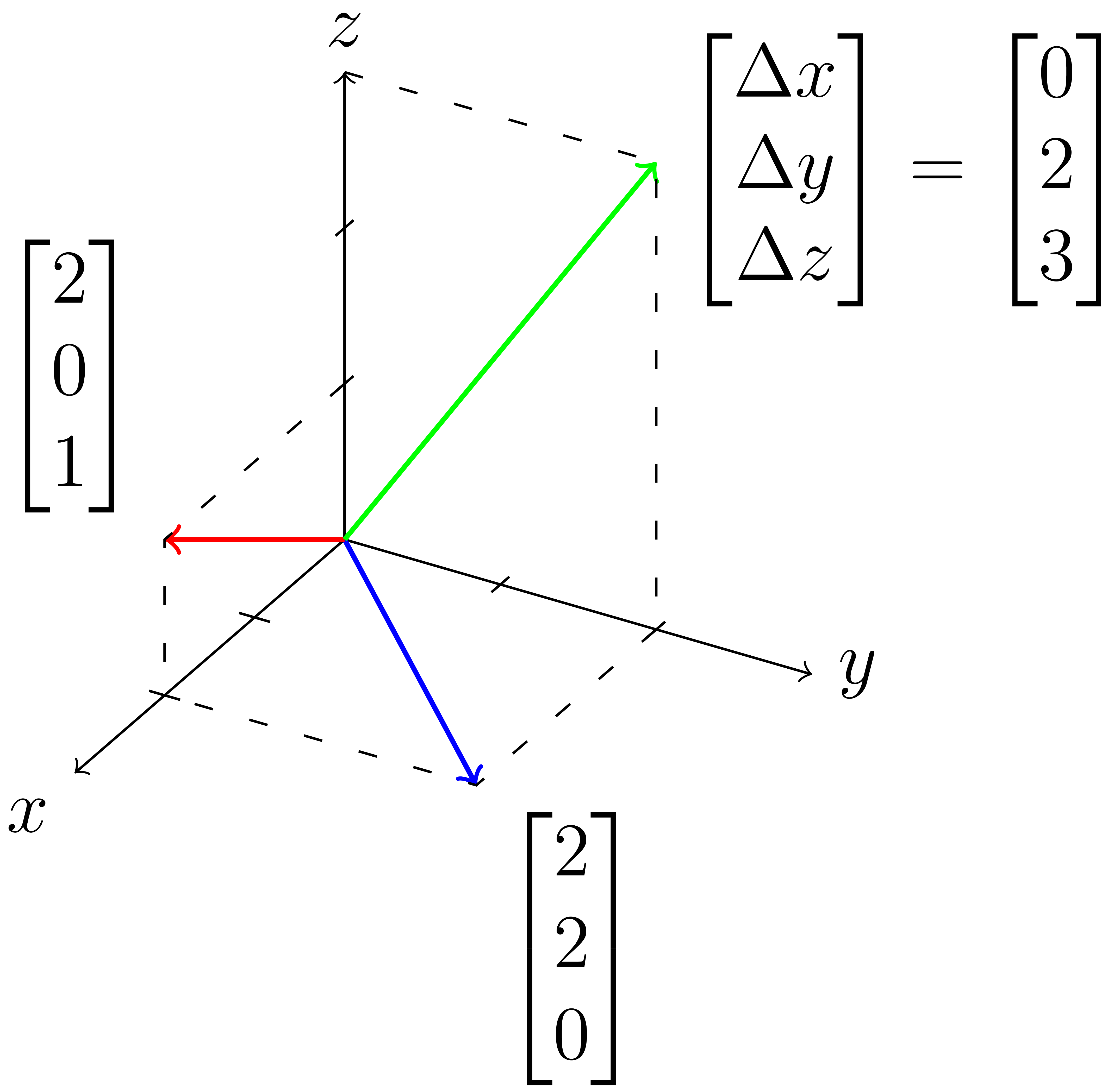
$$\overrightarrow{x} = (x_1, x_2) \qquad \mathbf{x} = (x, y)$$

$$\overrightarrow{v} = (v_1, v_2, v_3) \qquad \mathbf{v} = (v_1, v_2, v_3)$$

$$\overrightarrow{x} = (x_1, x_2, x_3) \qquad \mathbf{x} = (x, y, z)$$



z
(0, 2, 3)
(2, 0, 1)
y
x
(2, 2, 0)



z
$\begin{bmatrix}\Delta x\\ \Delta y\\ \Delta z\end{bmatrix} = \begin{bmatrix}0\\ 2\\ 3\end{bmatrix}$
$\begin{bmatrix}2\\ 0\\ 1\end{bmatrix}$
y
x
$\begin{bmatrix}2\\ 2\\ 0\end{bmatrix}$

$$\mathbb{R}^n$$

$$\overrightarrow{v} = (v_1, v_2, \ \dots, v_n)$$

$$\mathbf{v} = (v_1, v_2, \ \dots, v_n)$$