Linear Algebra and Geometry 1

Systems of equations, matrices, vectors, and geometry

Coordinate systems and coordinates

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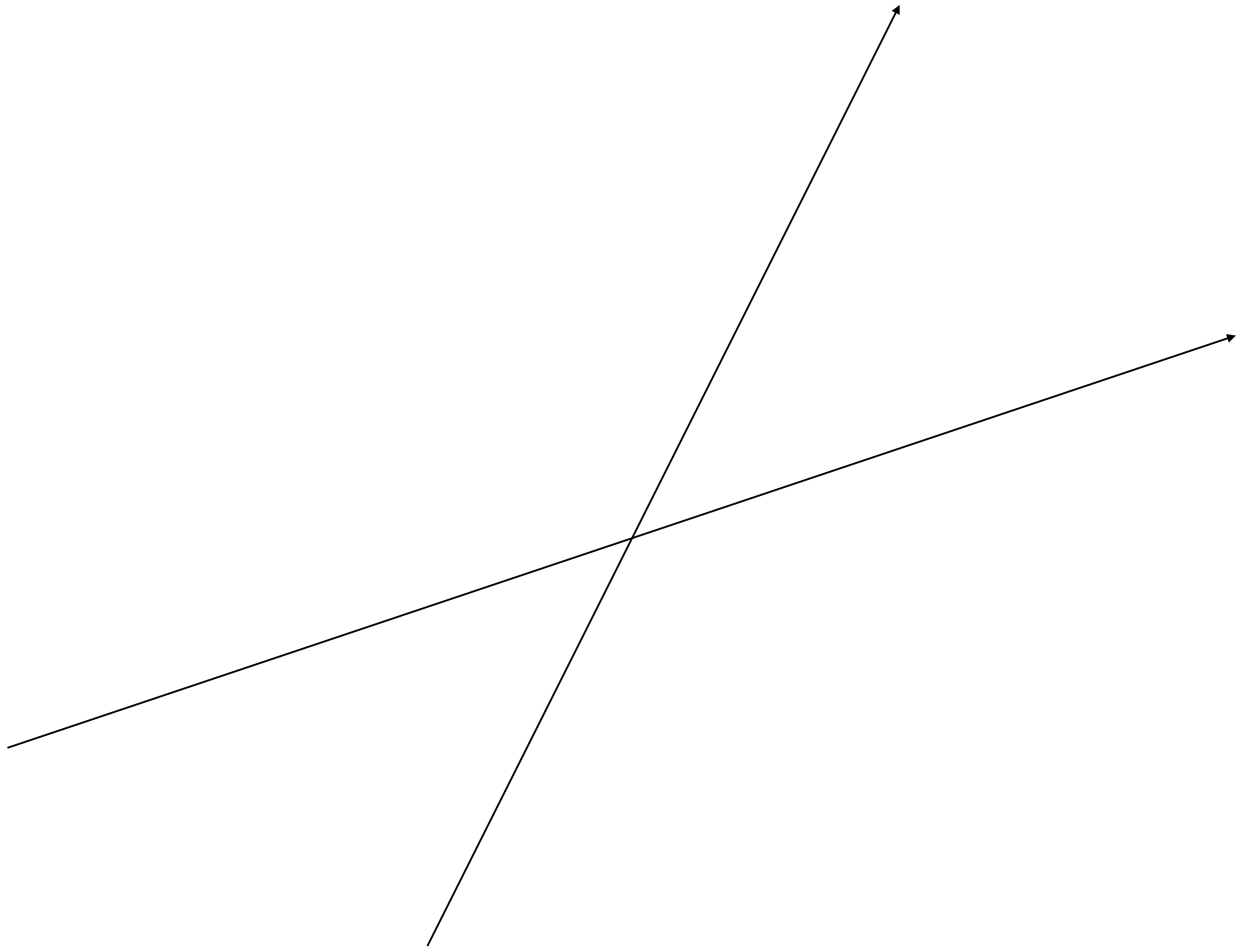
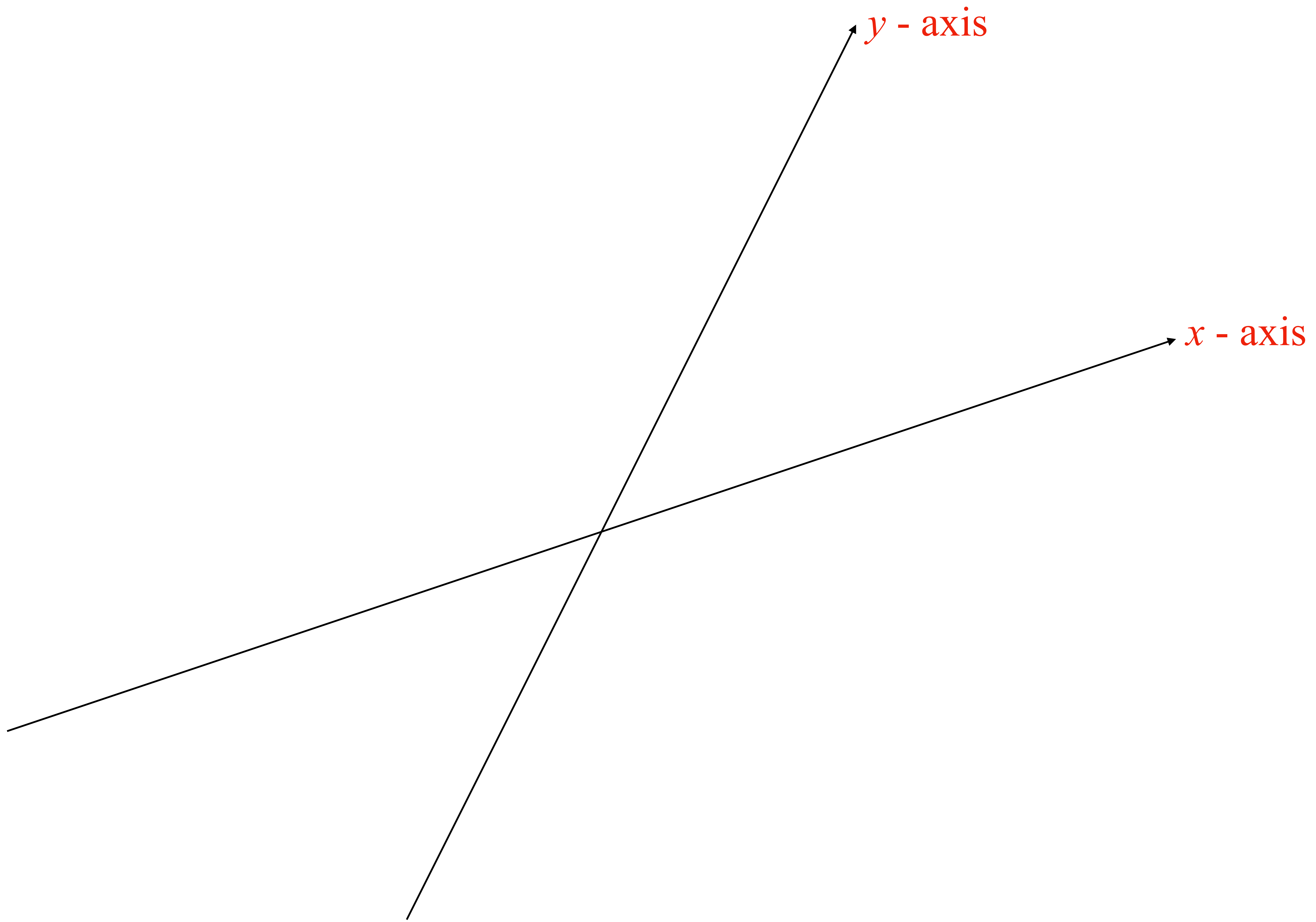
Man in The Middle AB

What you need to describe the position of each point in the plane or in the 3-space

What you need to describe the position of each point in the plane or in the 3-space

coordinate axes (singular: axis)



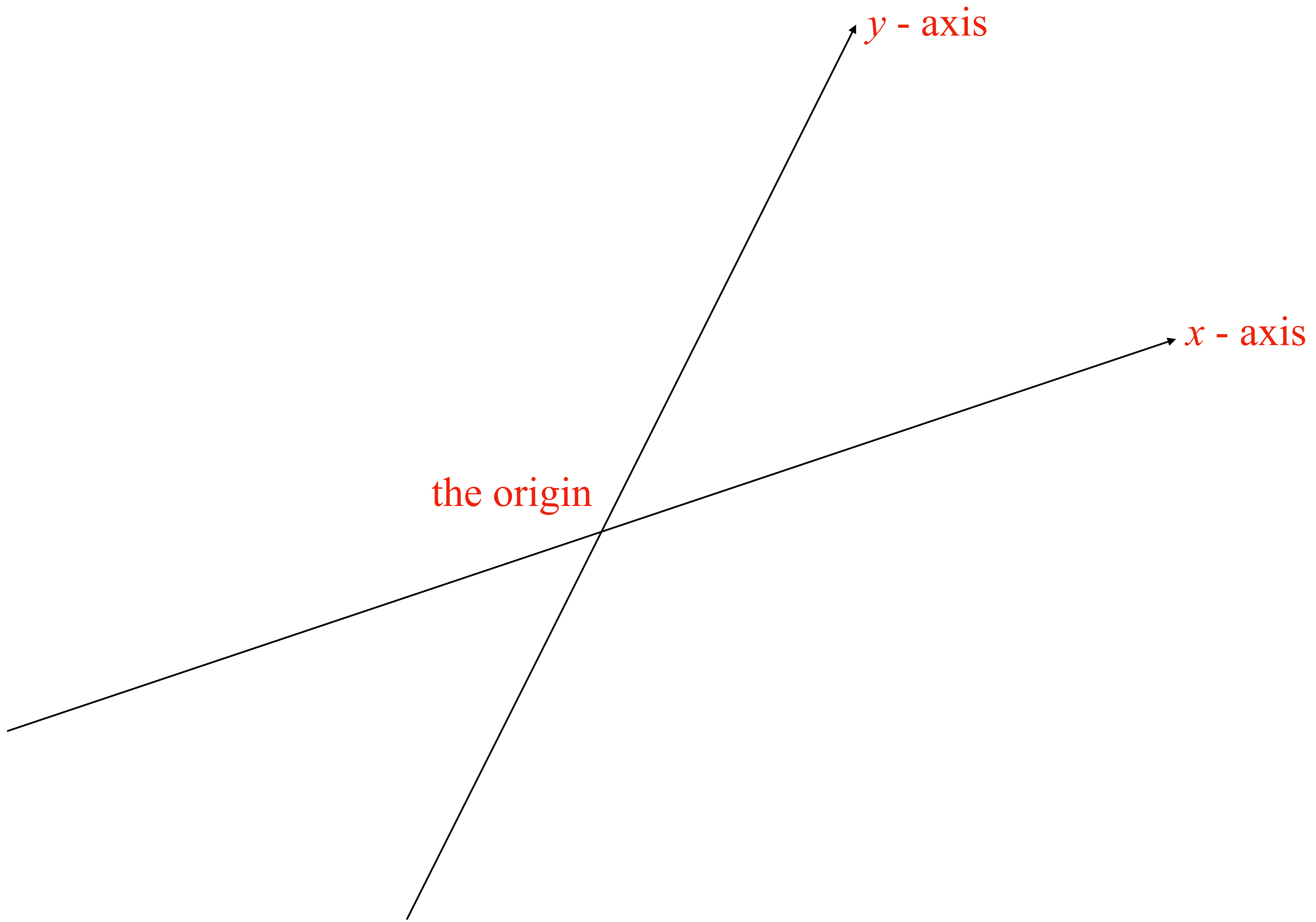


y - axis
x - axis

What you need to describe the position of each point in the plane or in the 3-space

coordinate axes (singular: axis)

the origin

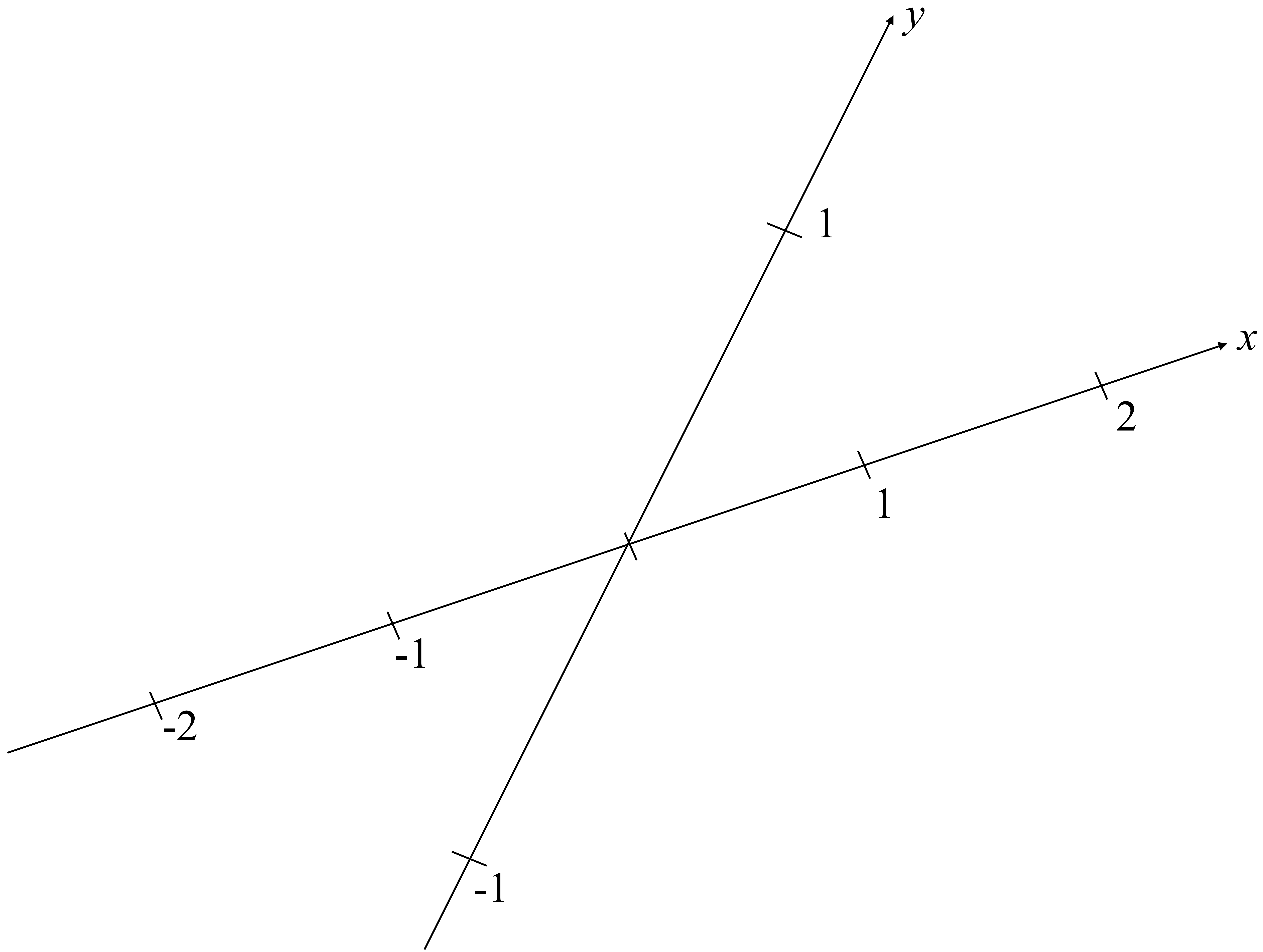

y - axis
x - axis
the origin

What you need to describe the position of each point in the plane or in the 3-space

coordinate axes (singular: axis)

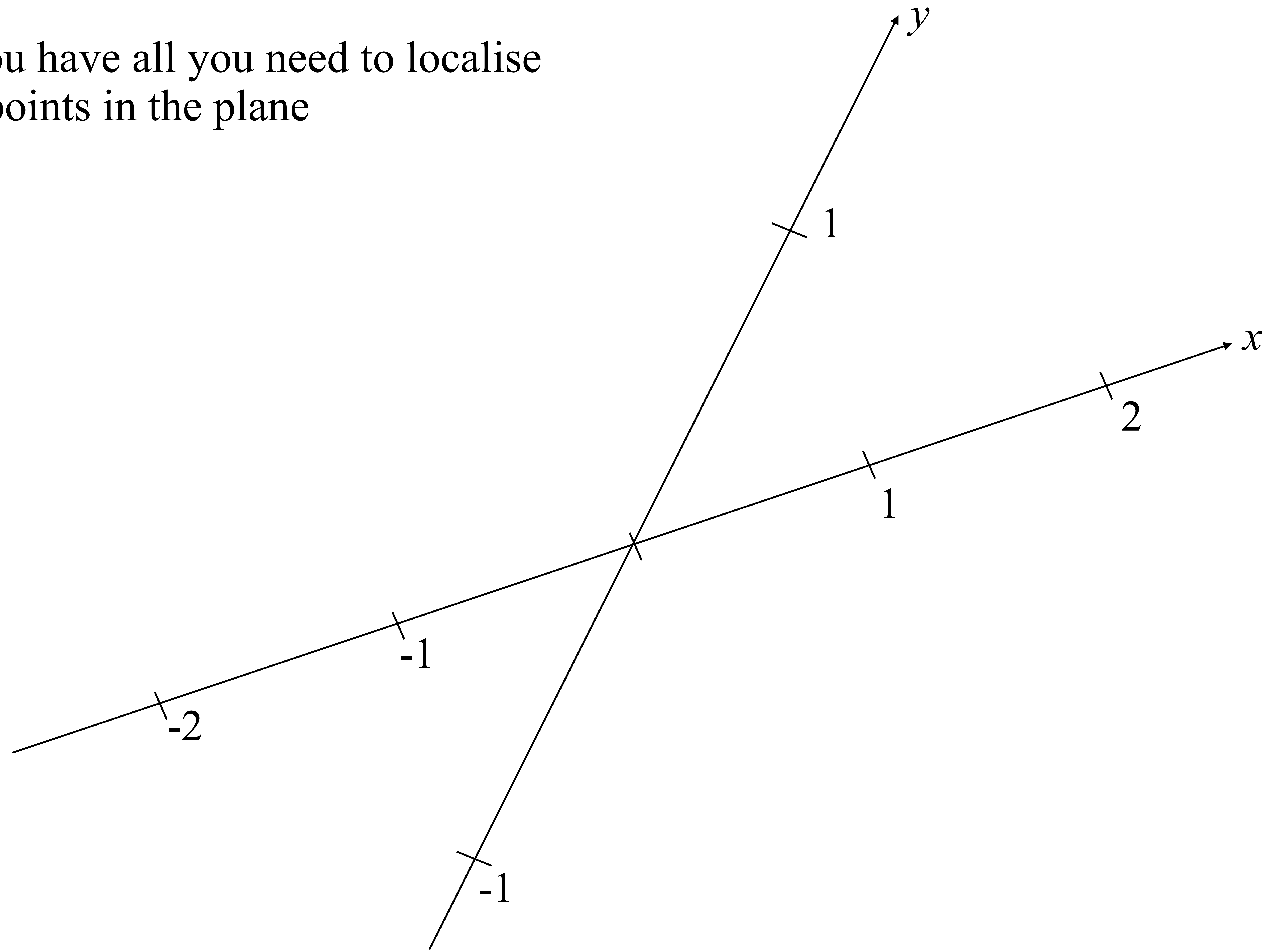
the origin

the unit on each axis



y
1
x
2
1
-1
-2
-1

Now you have all you need to localise
all the points in the plane



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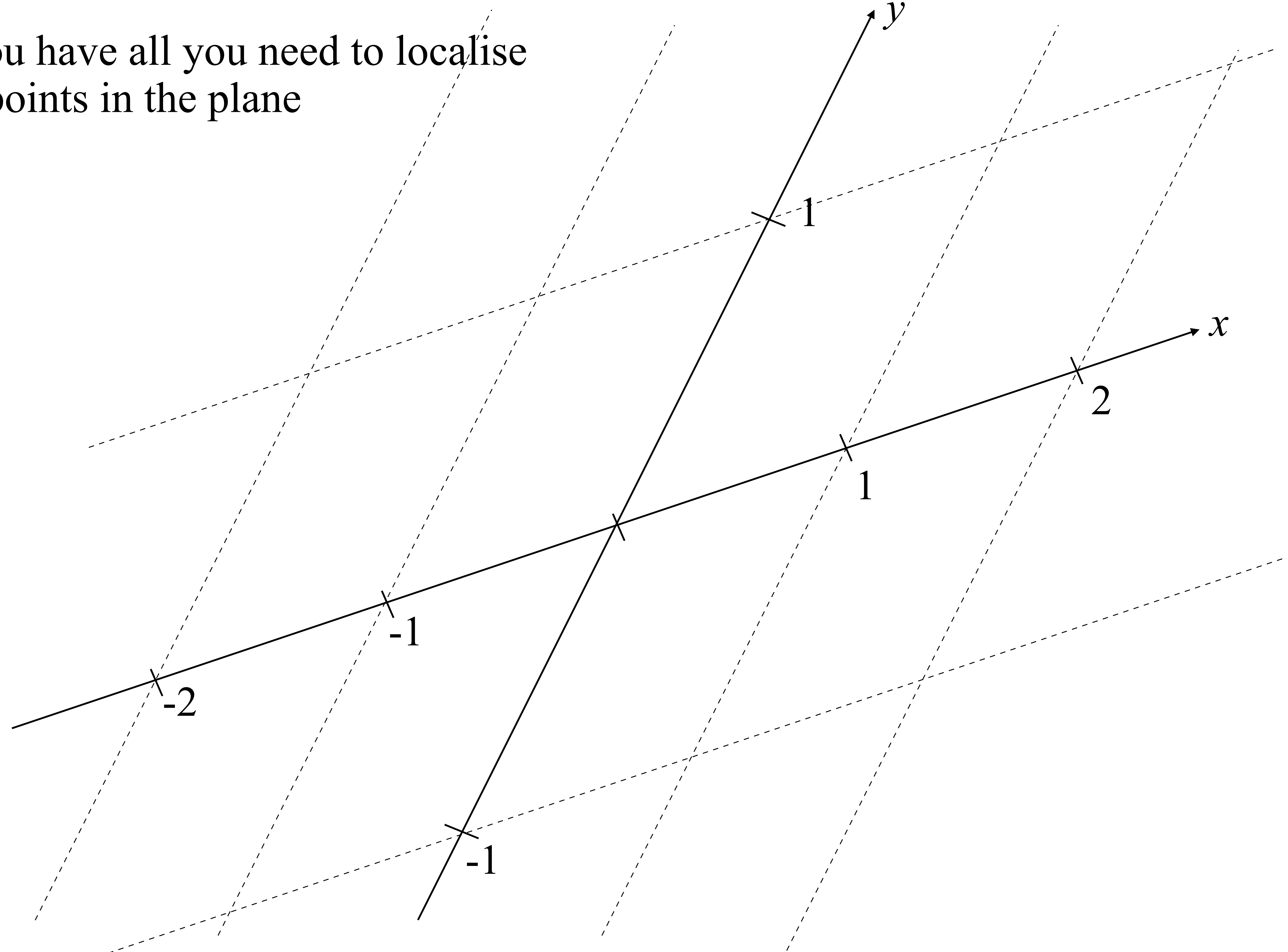
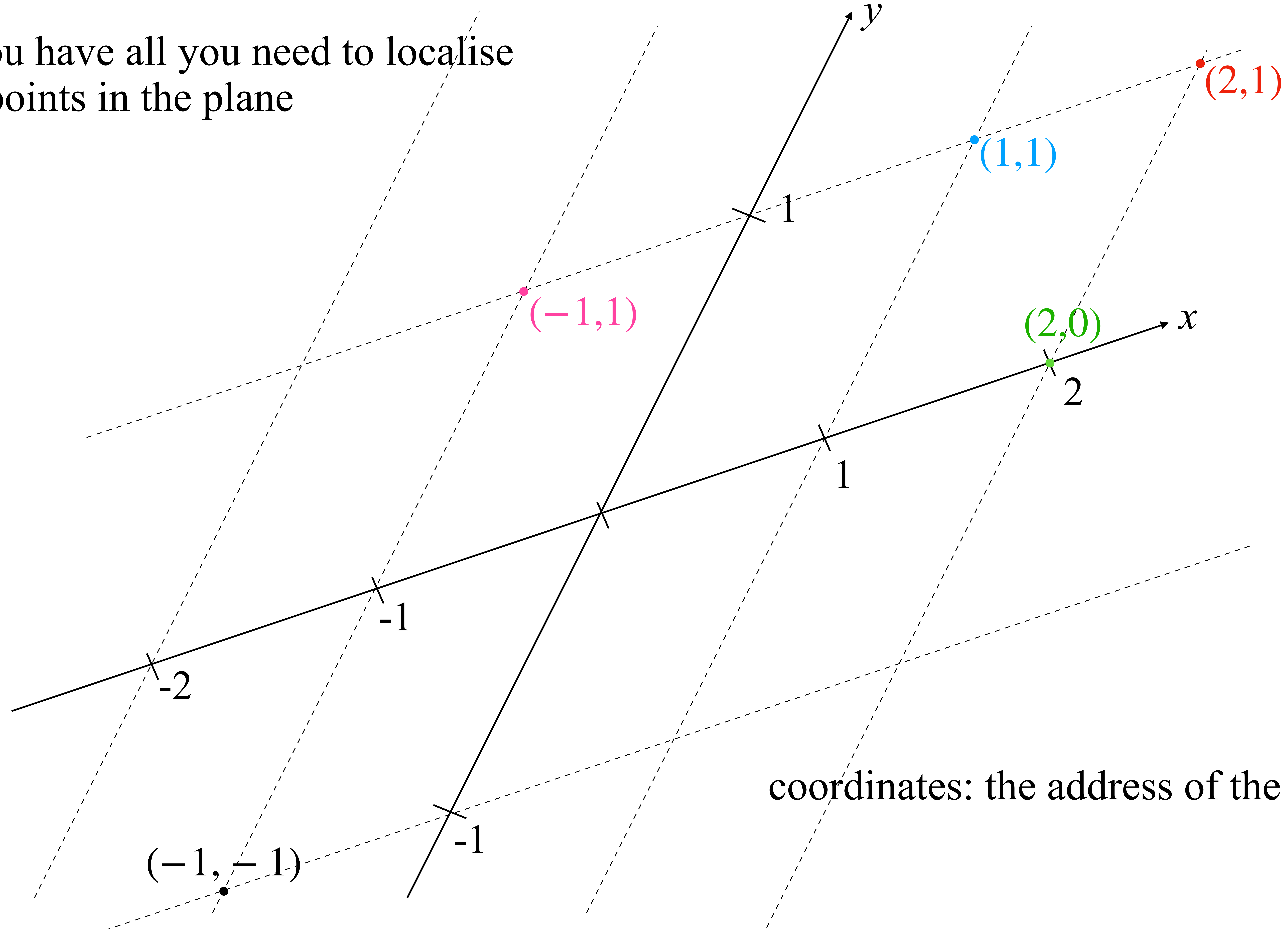
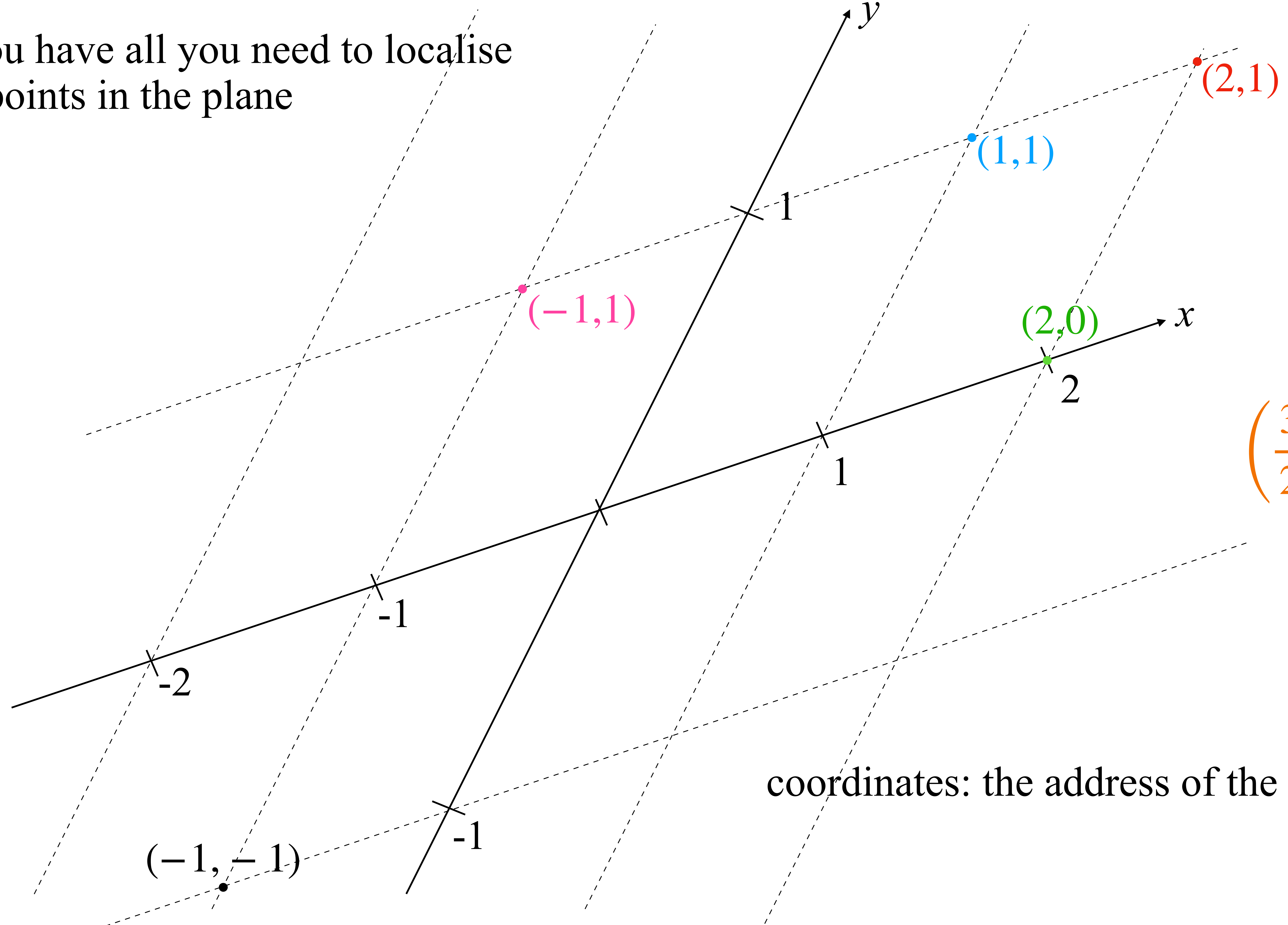


Now you have all you need to localise all the points in the plane



coordinates: the address of the point

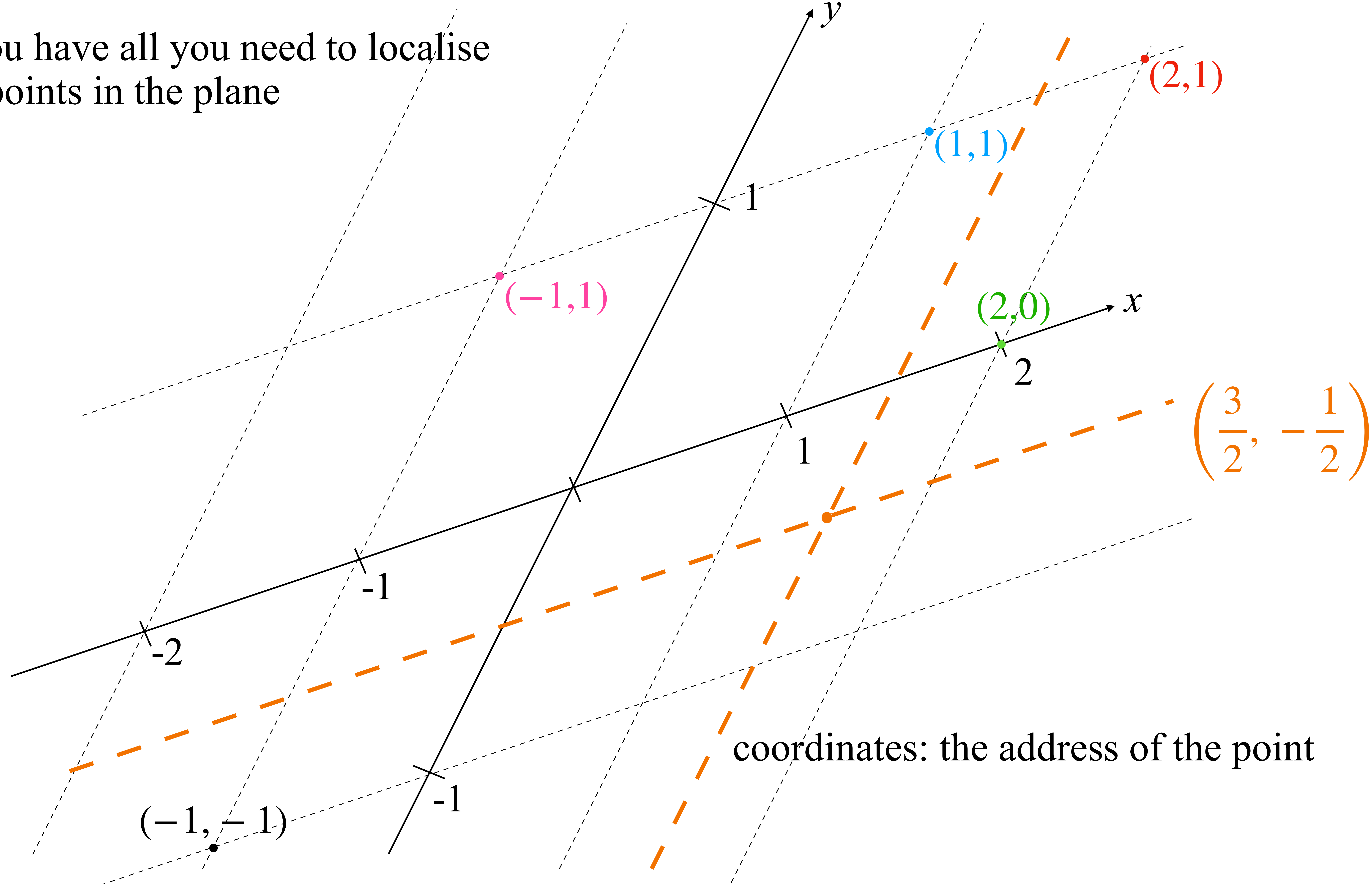
Now you have all you need to localise all the points in the plane



$\left(\frac{3}{2}, -\frac{1}{2}\right)$

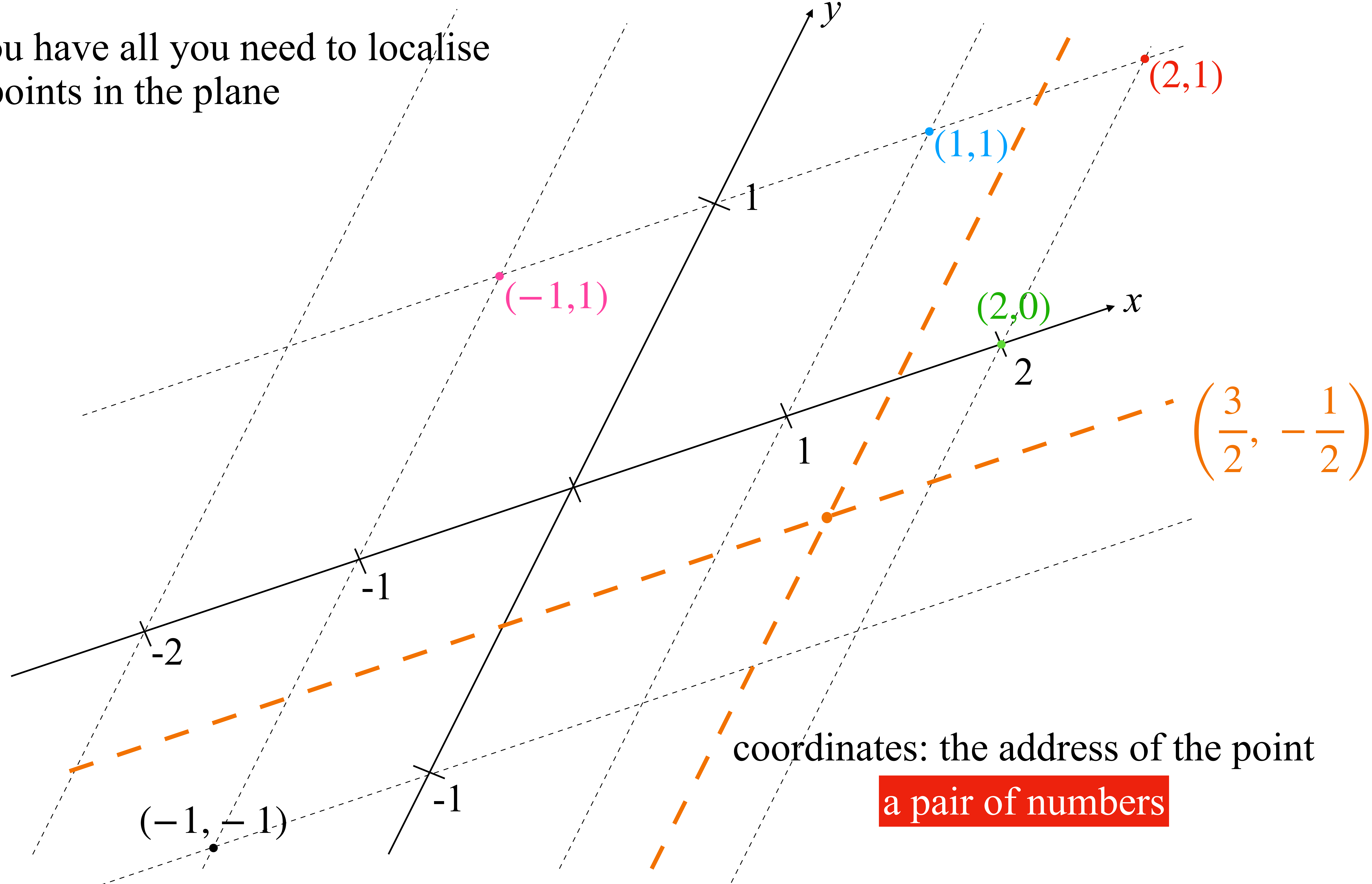
coordinates: the address of the point

Now you have all you need to localise all the points in the plane



coordinates: the address of the point

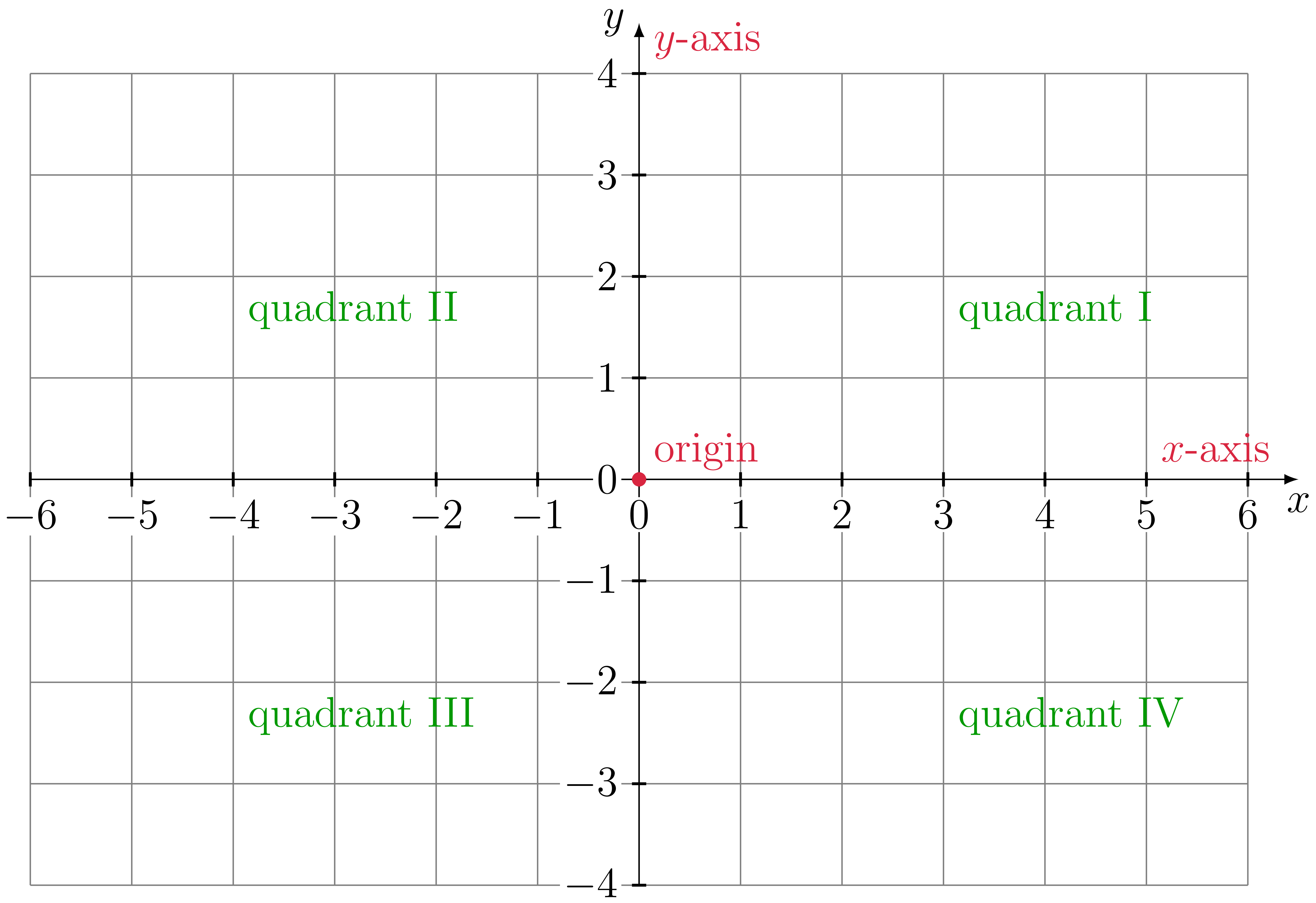
Now you have all you need to localise all the points in the plane



coordinates: the address of the point

a pair of numbers

Cartesian coordinate system



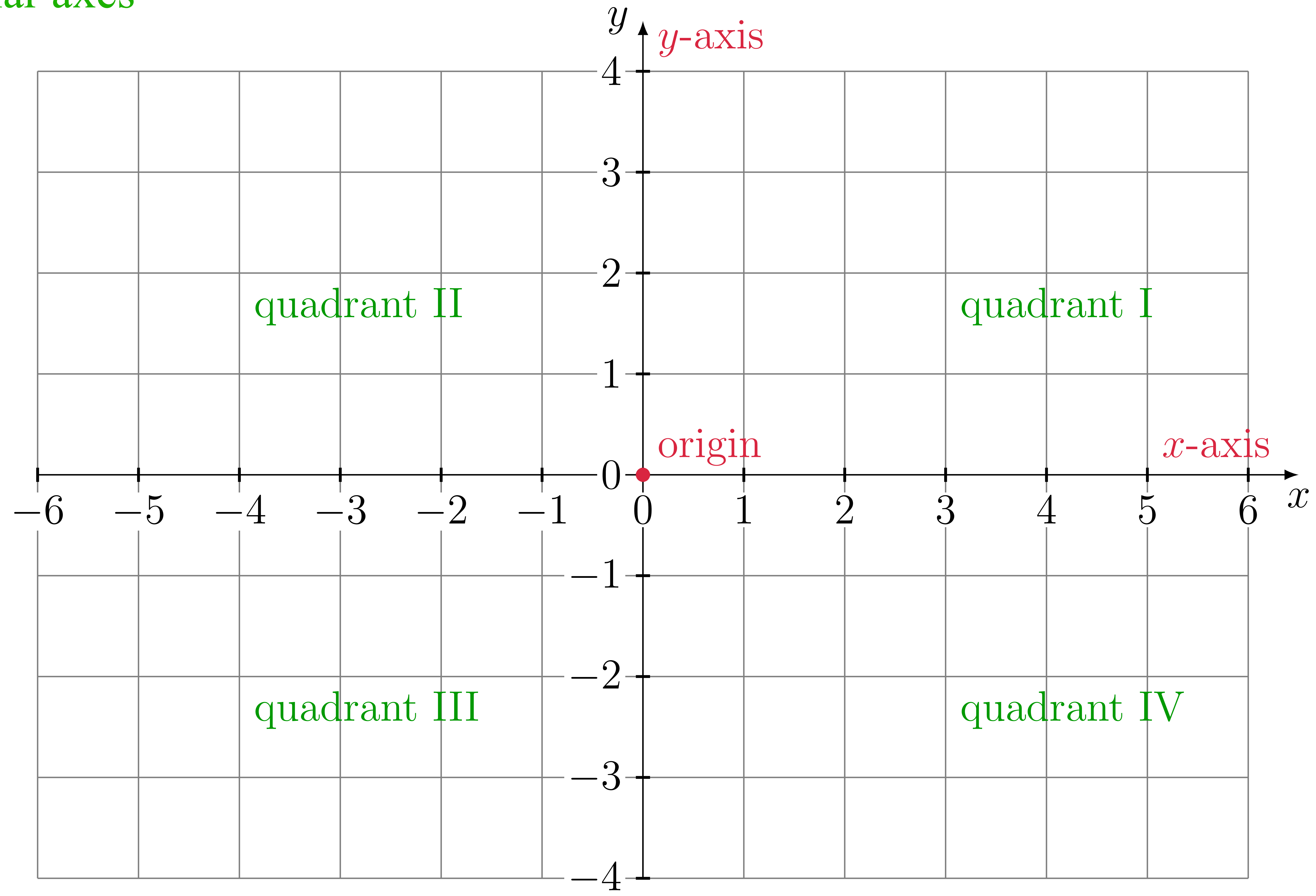
Cartesian coordinate system

René Descartes

1596—1650

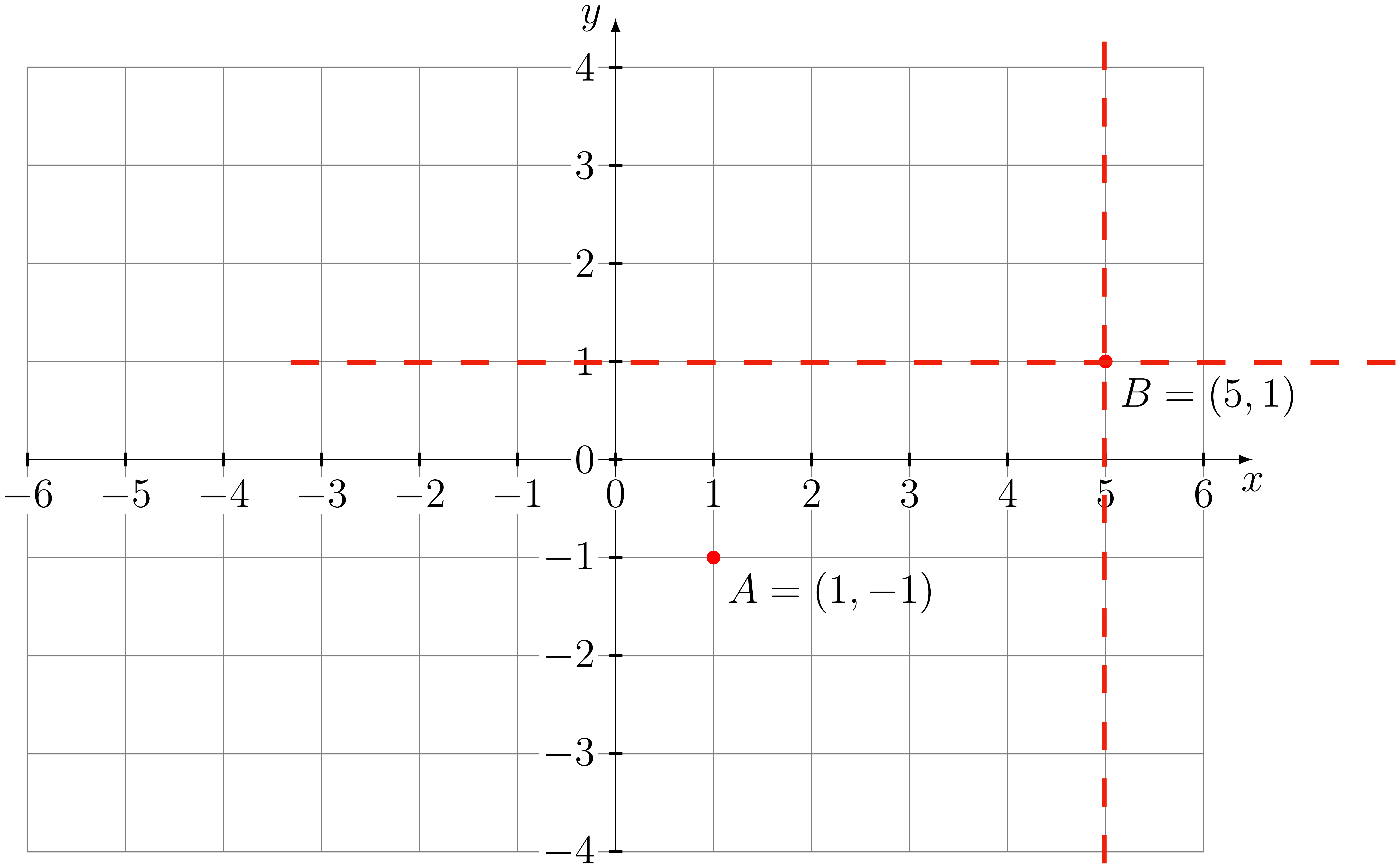
orthogonal / perpendicular axes

equal units



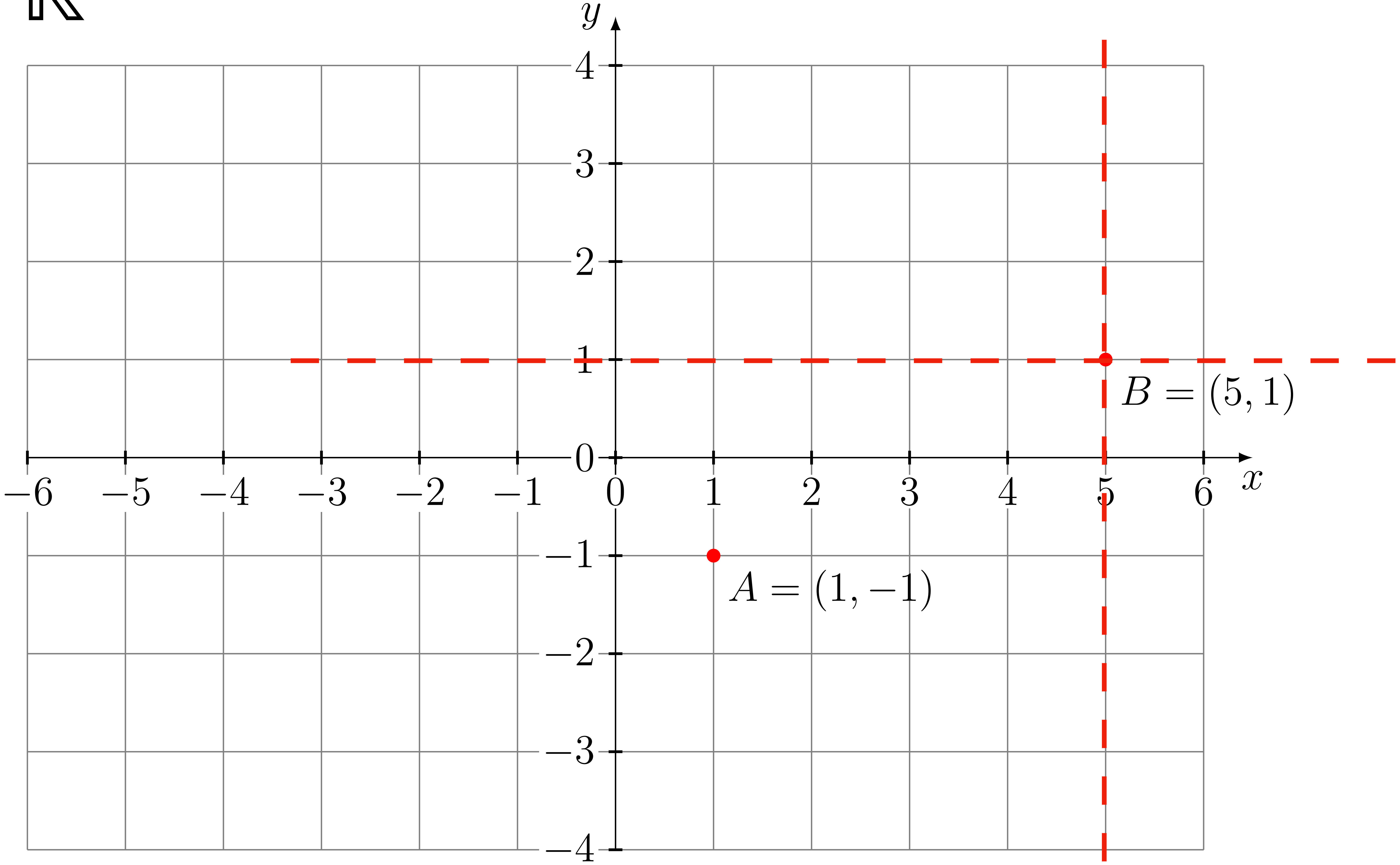
Cartesian coordinates = rectangular coordinates

Cartesian coordinate system



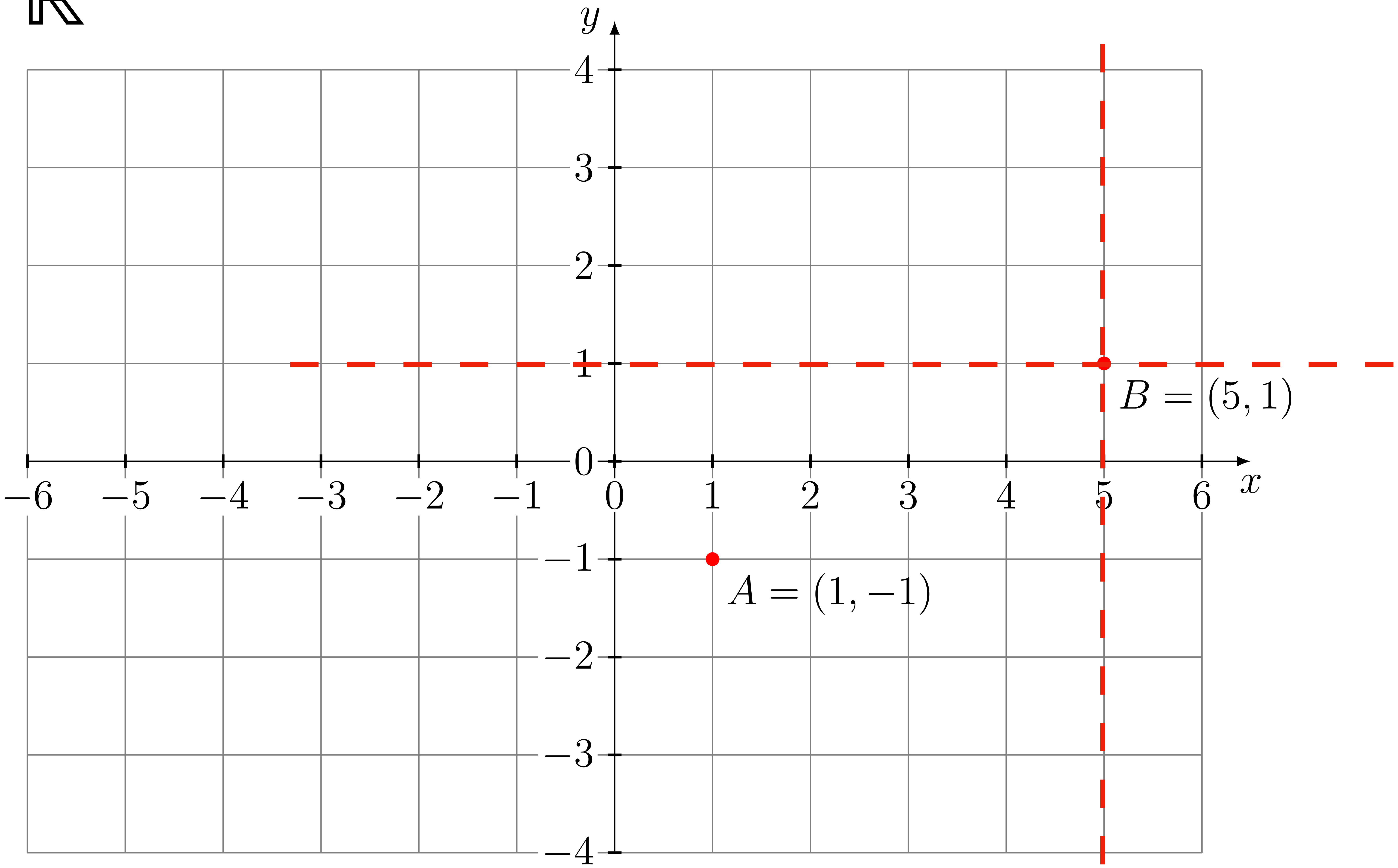
Cartesian coordinate system

The plane, $\mathbb{R}^2$



Cartesian coordinate system

The plane, $\mathbb{R}^2$



Cartesian product: $\mathbb{R}^2 = \mathbb{R} \times \mathbb{R} = \{\ (x, y);\ x \in \mathbb{R},\ \ y \in \mathbb{R}\ \}$

The 3-space

What you need to describe the position of each point in the plane or in the 3-space

coordinate axes (singular: axis)

the origin

the unit on each axis

The 3-space, $\mathbb{R}^3$

User:Jorge Stolfi

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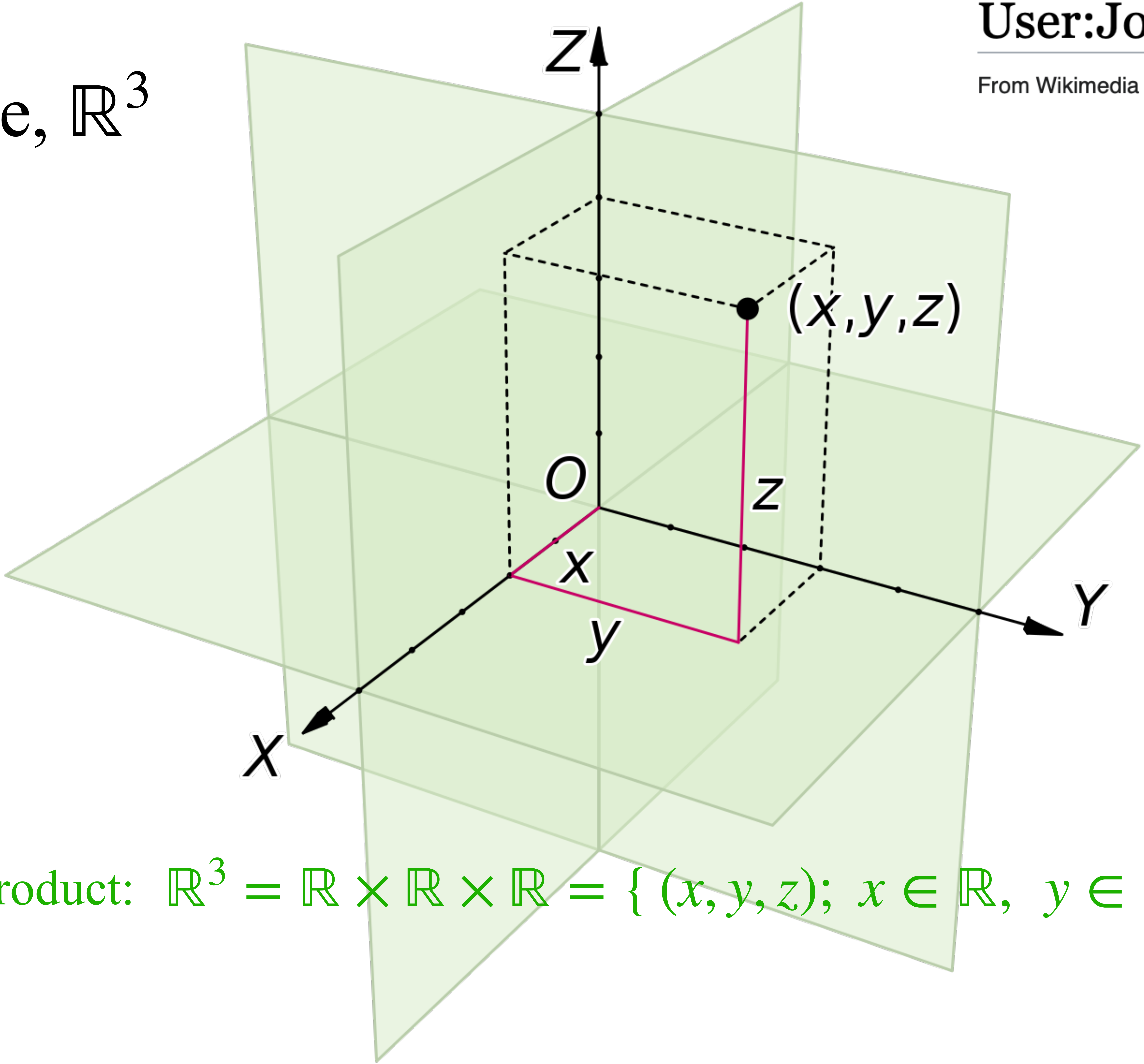
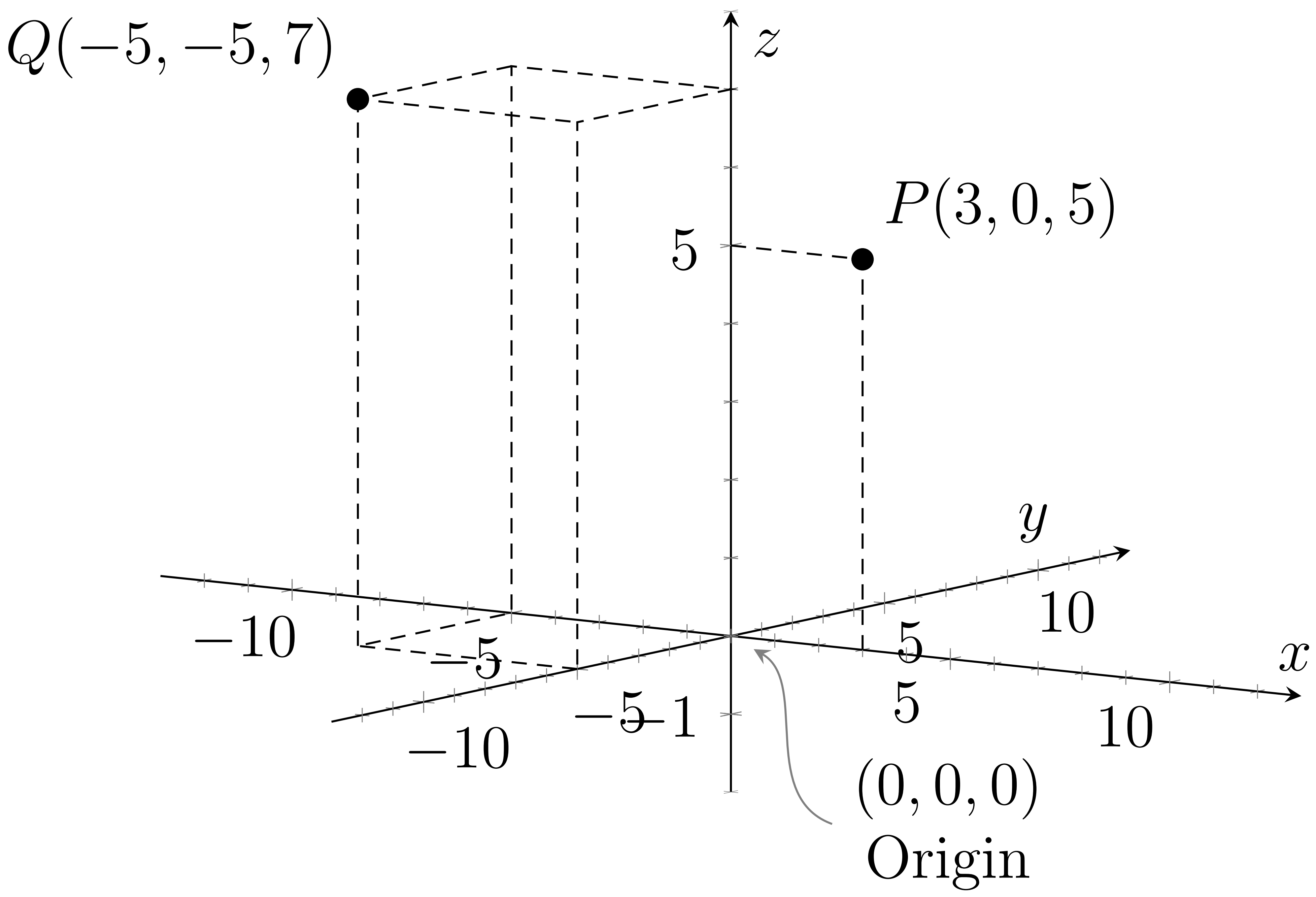
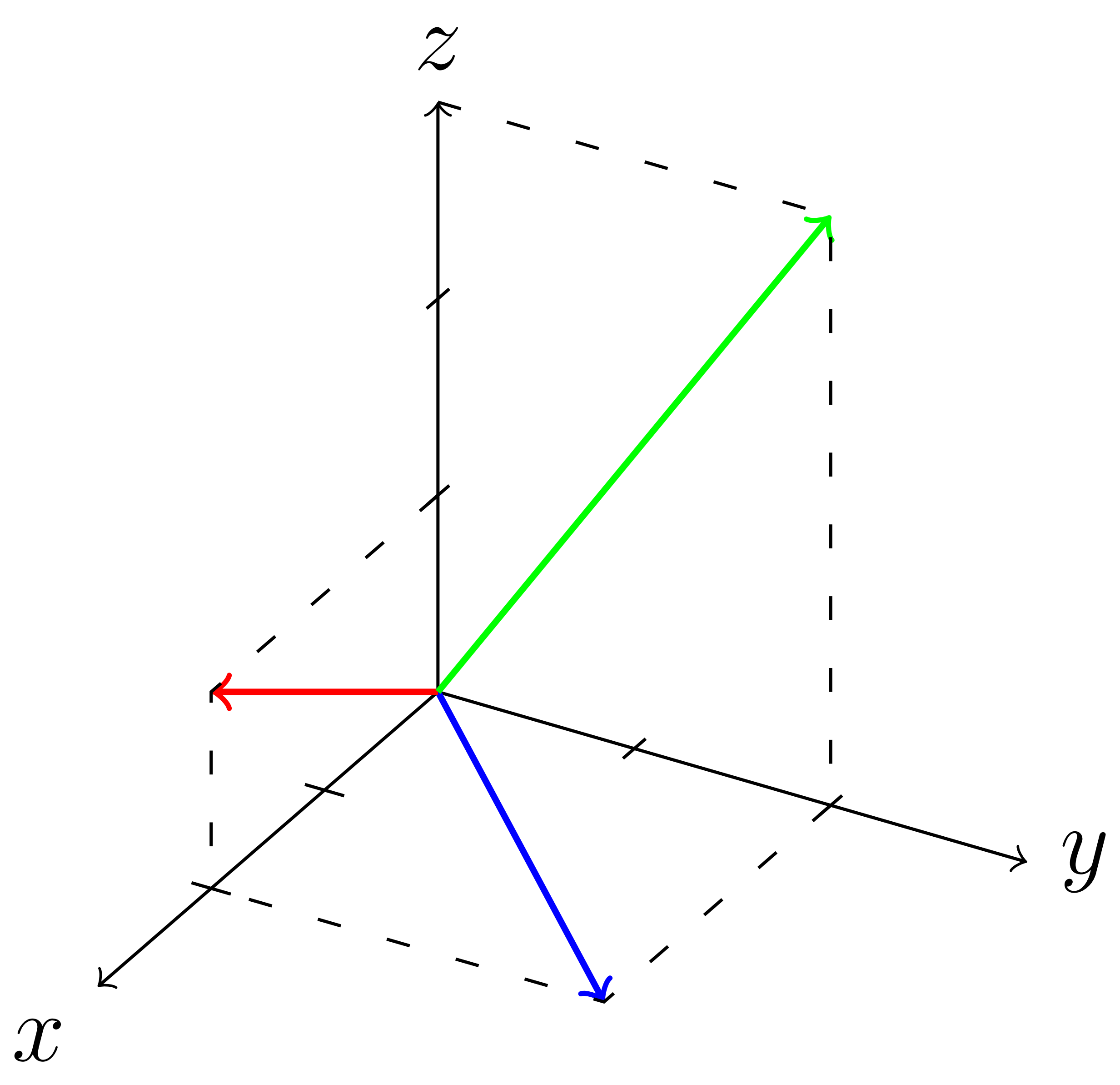


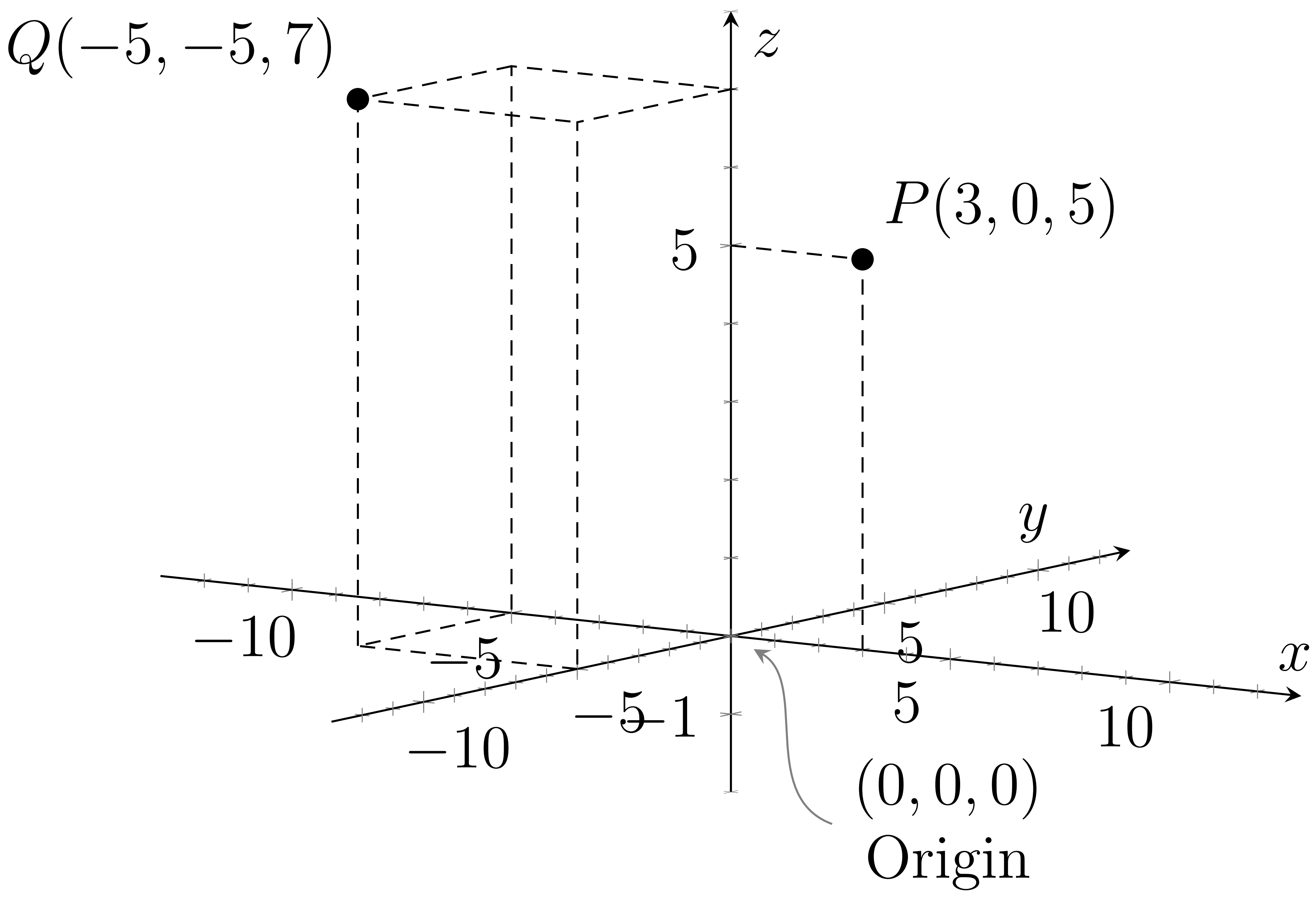
Cartesian product: $\mathbb{R}^3 = \mathbb{R} \times \mathbb{R} \times \mathbb{R} = \{ (x, y, z);\ x \in \mathbb{R},\ \ y \in \mathbb{R},\ \ z \in \mathbb{R} \}$

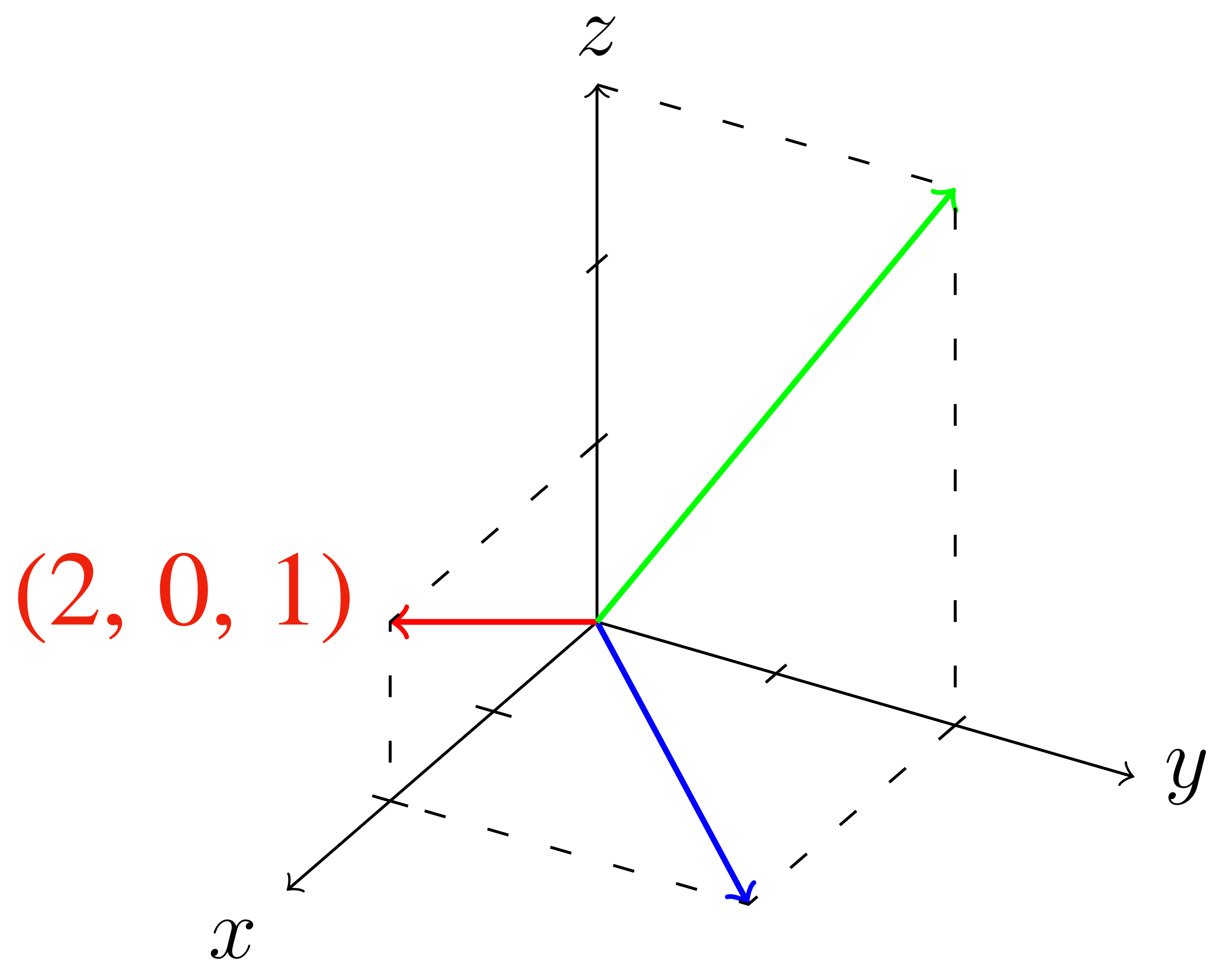
Cartesian coordinate system



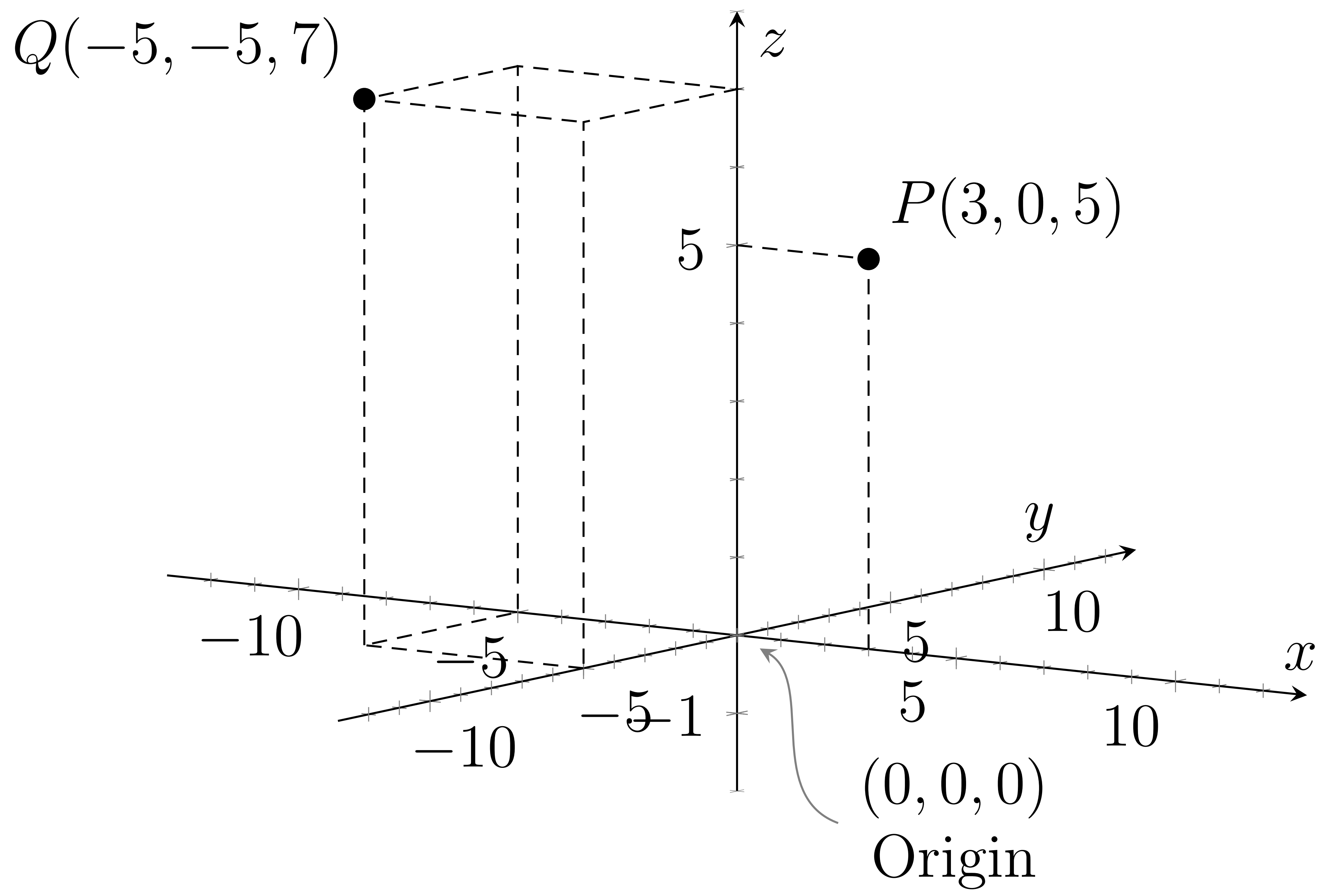


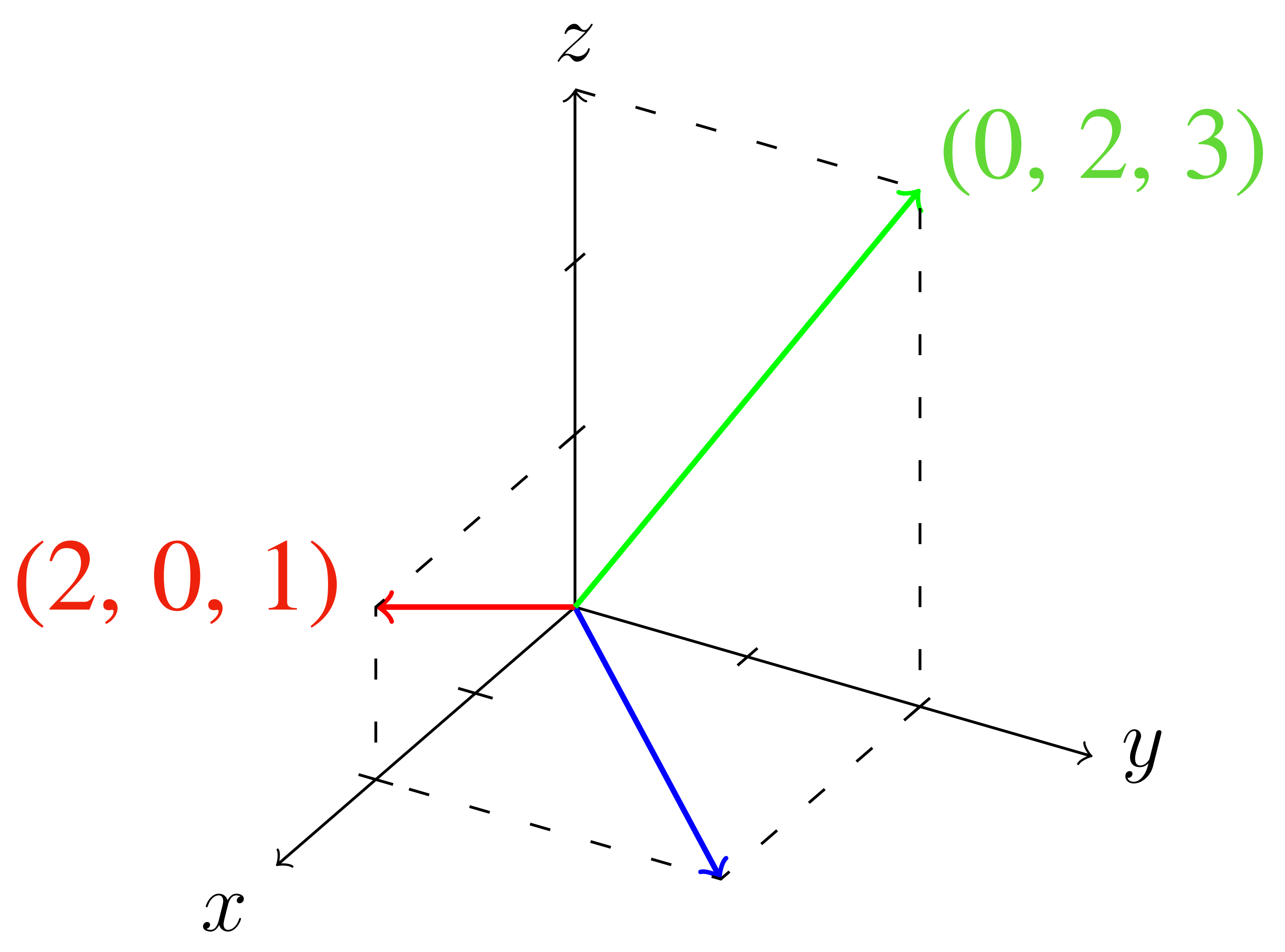
Cartesian coordinate system



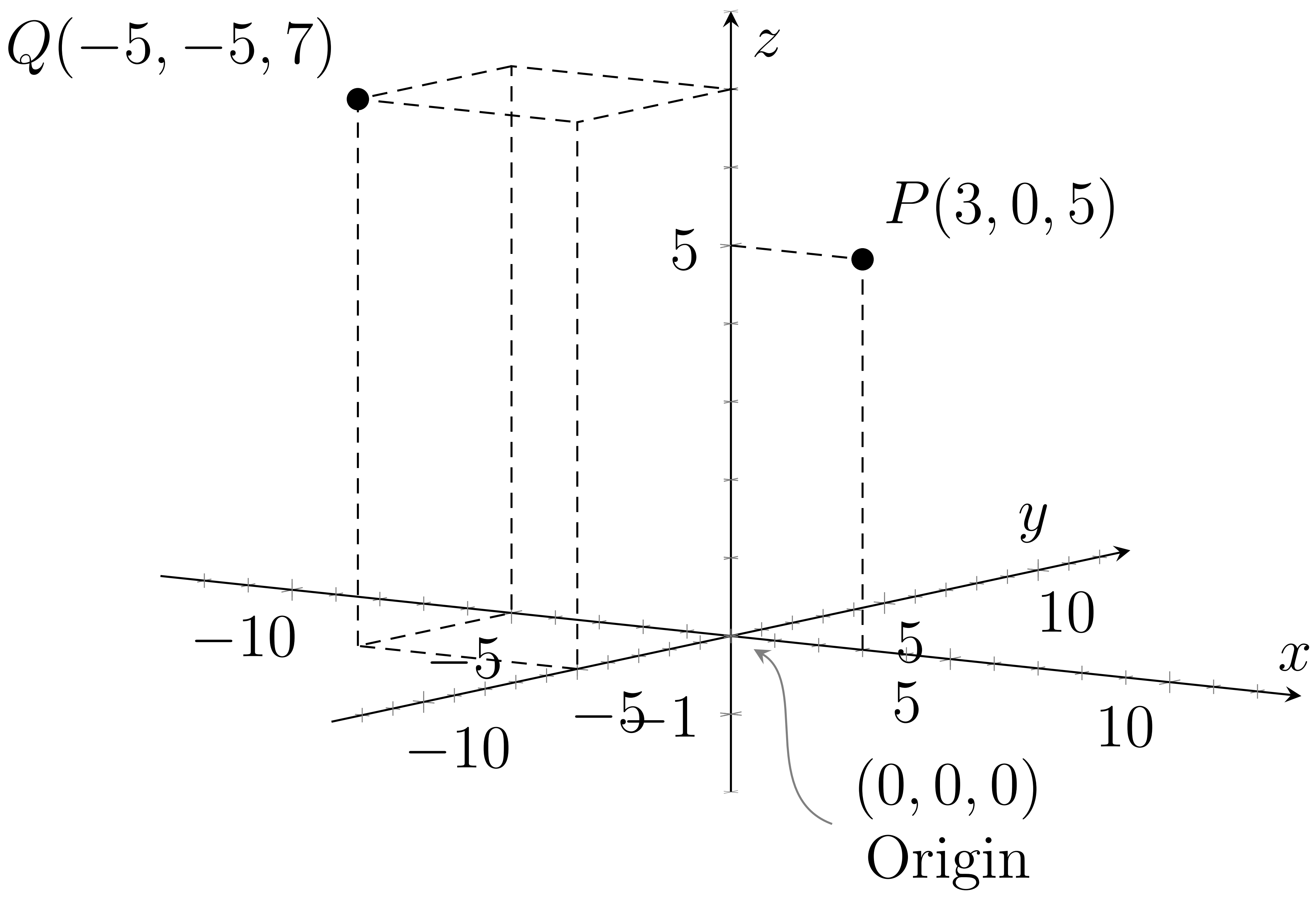


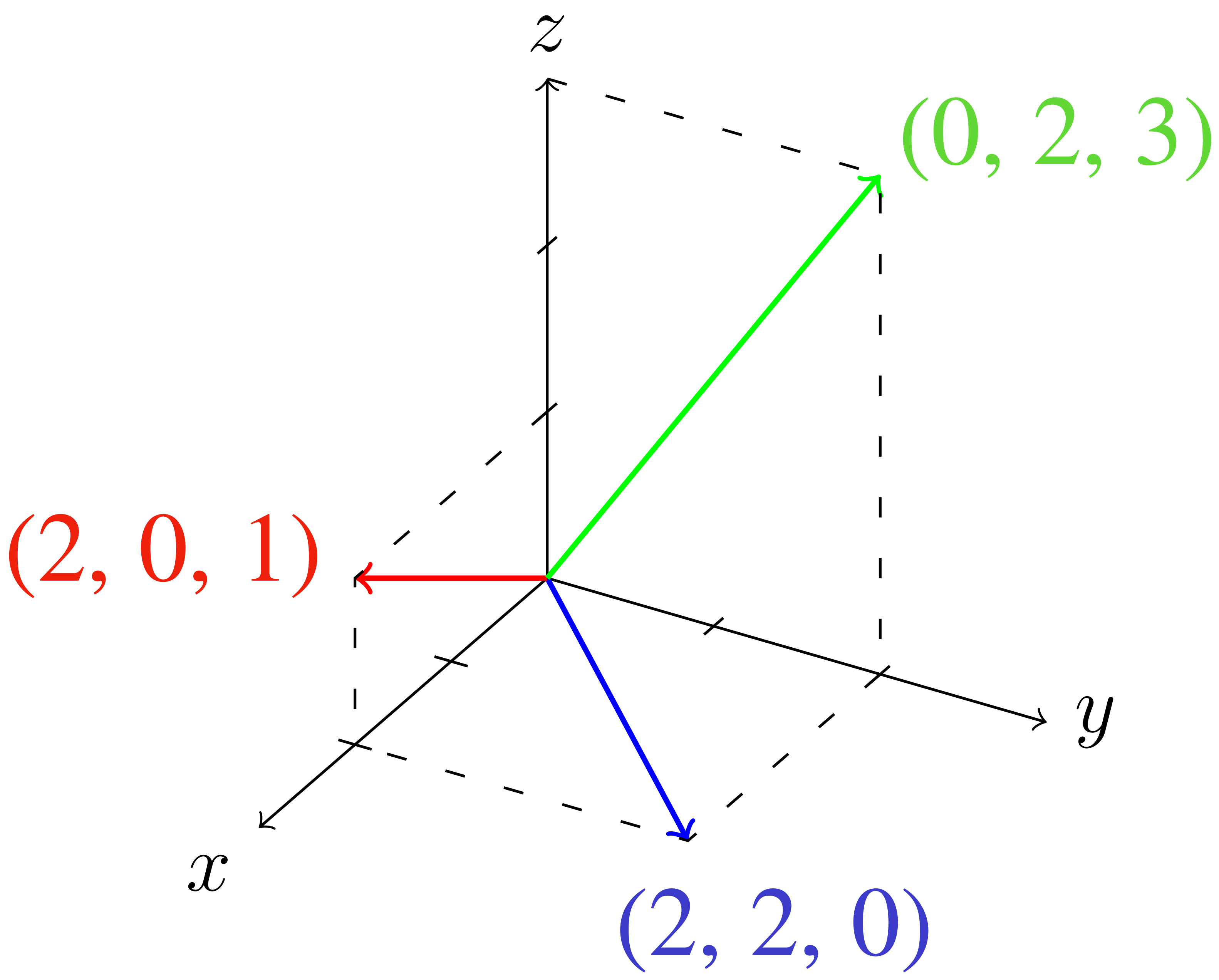
Cartesian coordinate system



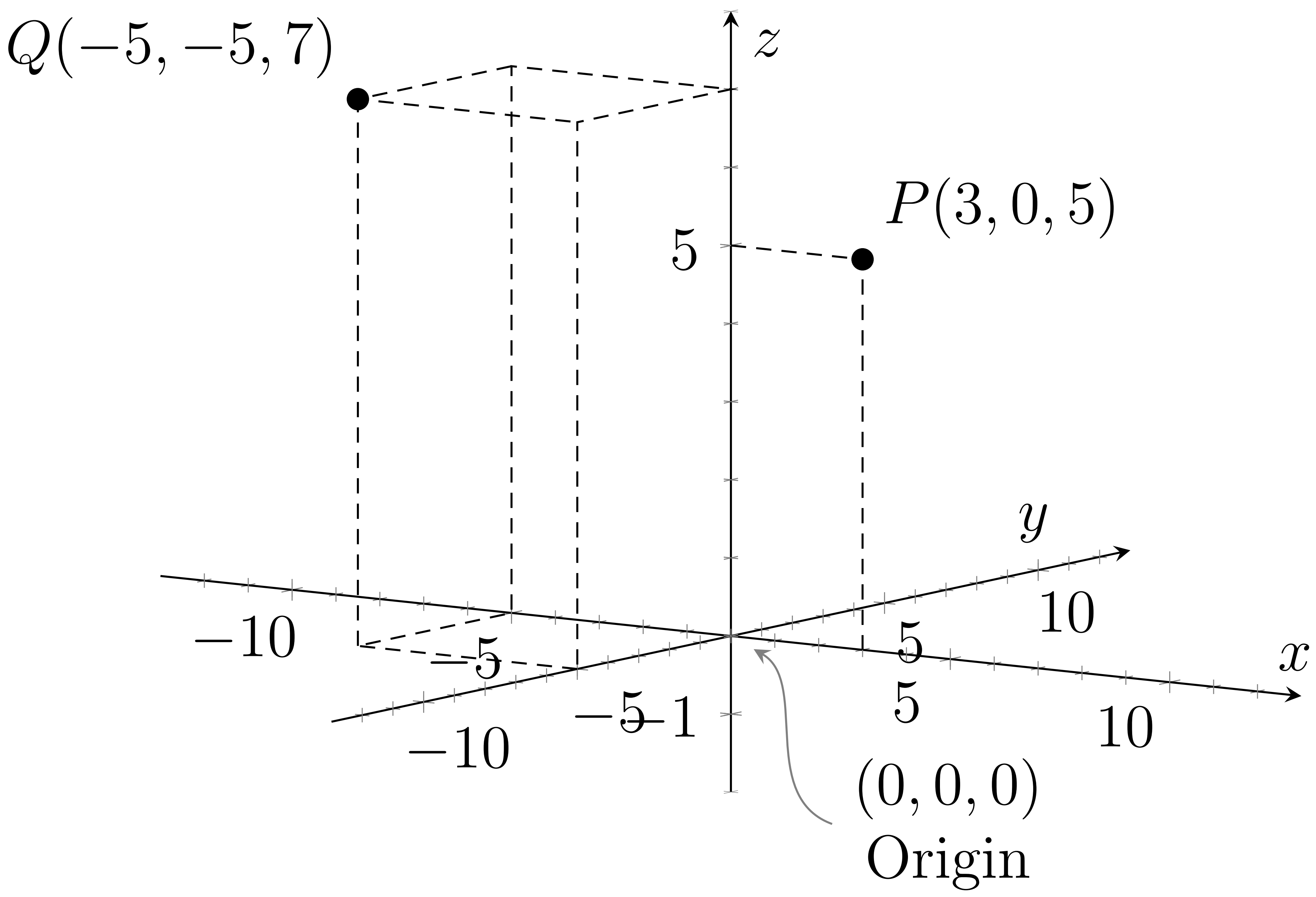


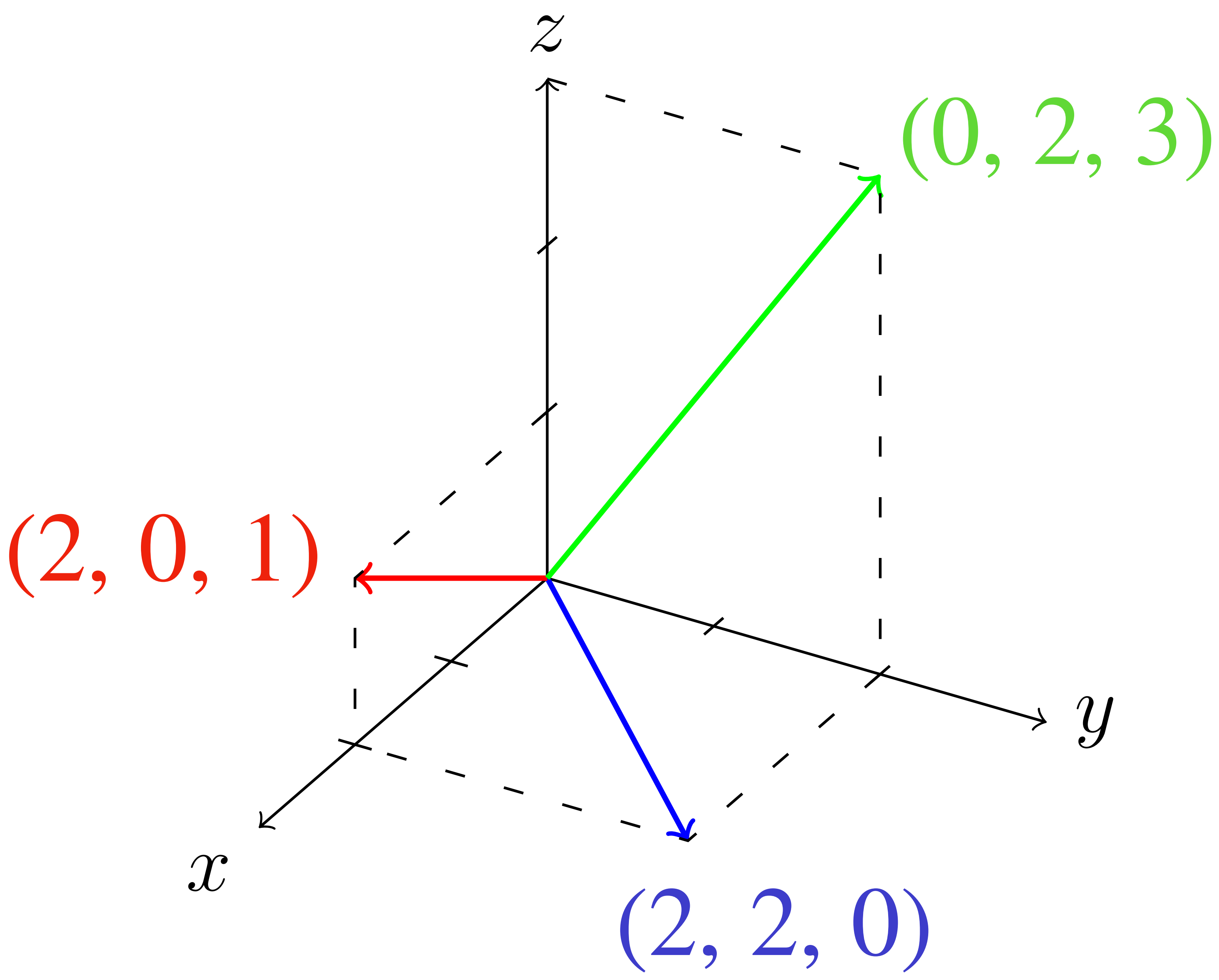
Cartesian coordinate system





Cartesian coordinate system





coordinates: the address of the point

a triple of numbers

The n-space

$$\mathbb{R}^n$$

$$(x_1, x_2, \ \ldots, x_n)$$

$$\mathbb{R}^n$$

$$(x_1, x_2, \ \dots, x_n)$$

Cartesian product: $\mathbb{R}^n = \mathbb{R} \times \mathbb{R} \times \dots \times \mathbb{R} = \{ (x_1, x_2, \dots, x_n); \ x_i \in \mathbb{R} \ \text{ for } \ i = 1,2,\dots, n \}$

$$\mathbb{R}^n$$

$$(x_1, x_2, \ \ldots, x_n)$$

Cartesian product: $\mathbb{R}^n = \mathbb{R} \times \mathbb{R} \times \ldots \times \mathbb{R} = \{\, (x_1, x_2, \ldots, x_n);\ x_i \in \mathbb{R} \ \text{ for } \ i = 1,2,\ldots, n \,\}$

coordinates: the address of the point

n-tuple of numbers

$$\mathbb{R}^n$$

$$(x_1, x_2, \ \ldots, x_n)$$

Cartesian product: $\mathbb{R}^n = \mathbb{R} \times \mathbb{R} \times \ldots \times \mathbb{R} = \{\ (x_1, x_2, \ldots, x_n);\ \ x_i \in \mathbb{R} \ \text{ for } \ i = 1,2,\ldots, n\ \}$

Coordinates of the origin are $(0,\ 0,\ \ \ldots,\ 0)$

coordinates: the address of the point

n-tuple of numbers