

Two vectors  $\vec{u}$  and  $\vec{v}$  are equal to each other if they have the same magnitude and the same direction. In the xy-coordinate system, they would equal to each other if and only if their corresponding components are the same.

### Example

What value(s) of  $a$  make  $\vec{u}$  and  $\vec{v}$  equal vectors, given that  $\vec{u} = (4, 5)$  and  $\vec{v} = (a^2, 5)$ ?

$$\vec{u} = \vec{v} \text{ if and only if } 4 = a^2 \quad \text{Square root both sides}$$

$$\pm\sqrt{4} = a$$

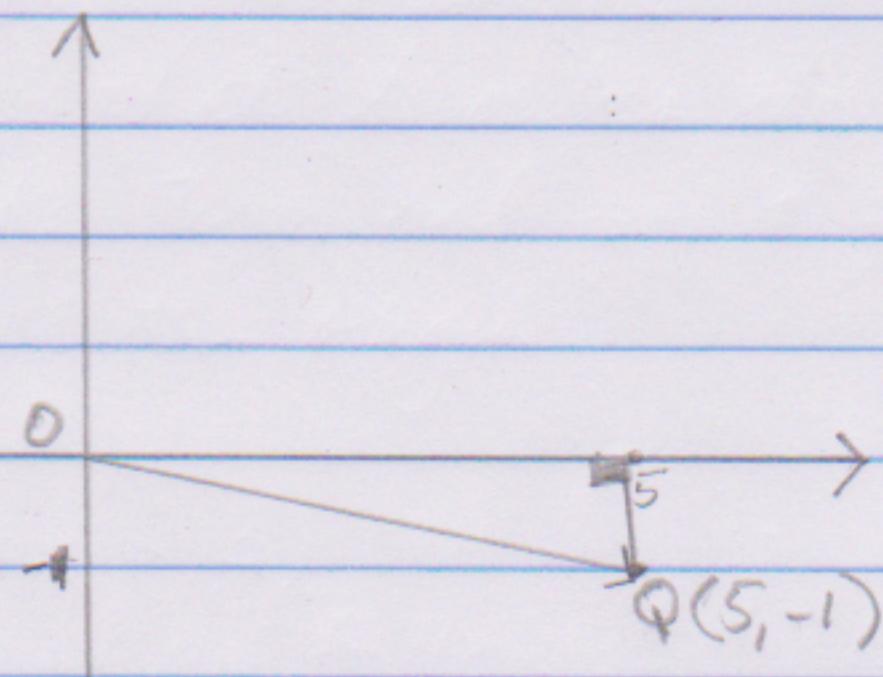
$$a = \pm 2$$

So  $x = \pm 2$  will make  $\vec{u} = \vec{v}$ .

How to calculate the length or the magnitude of a vector?

### Example

Let  $\vec{v} = (5, -1)$



As you can see from the picture, this vector forms a right triangle whose hypotenuse has the length equal to the magnitude of  $\vec{v} = \overrightarrow{OQ}$ . Since  $Q(5, -1)$ , then the sides of the right triangle are of the length 5 and  $|-1| = 1$ .

Therefore, by Pythagoras theorem, the length of the vector  $\vec{v}$  is

$$\sqrt{5^2 + (-1)^2} = \sqrt{26}$$