Remember that…

Distance from vertex to focus = Distance from vertex to directrix

We will call this distance $\boldsymbol{c}$.

In all of the following equations…

$$\boldsymbol{a = \frac{1}{4c}}$$

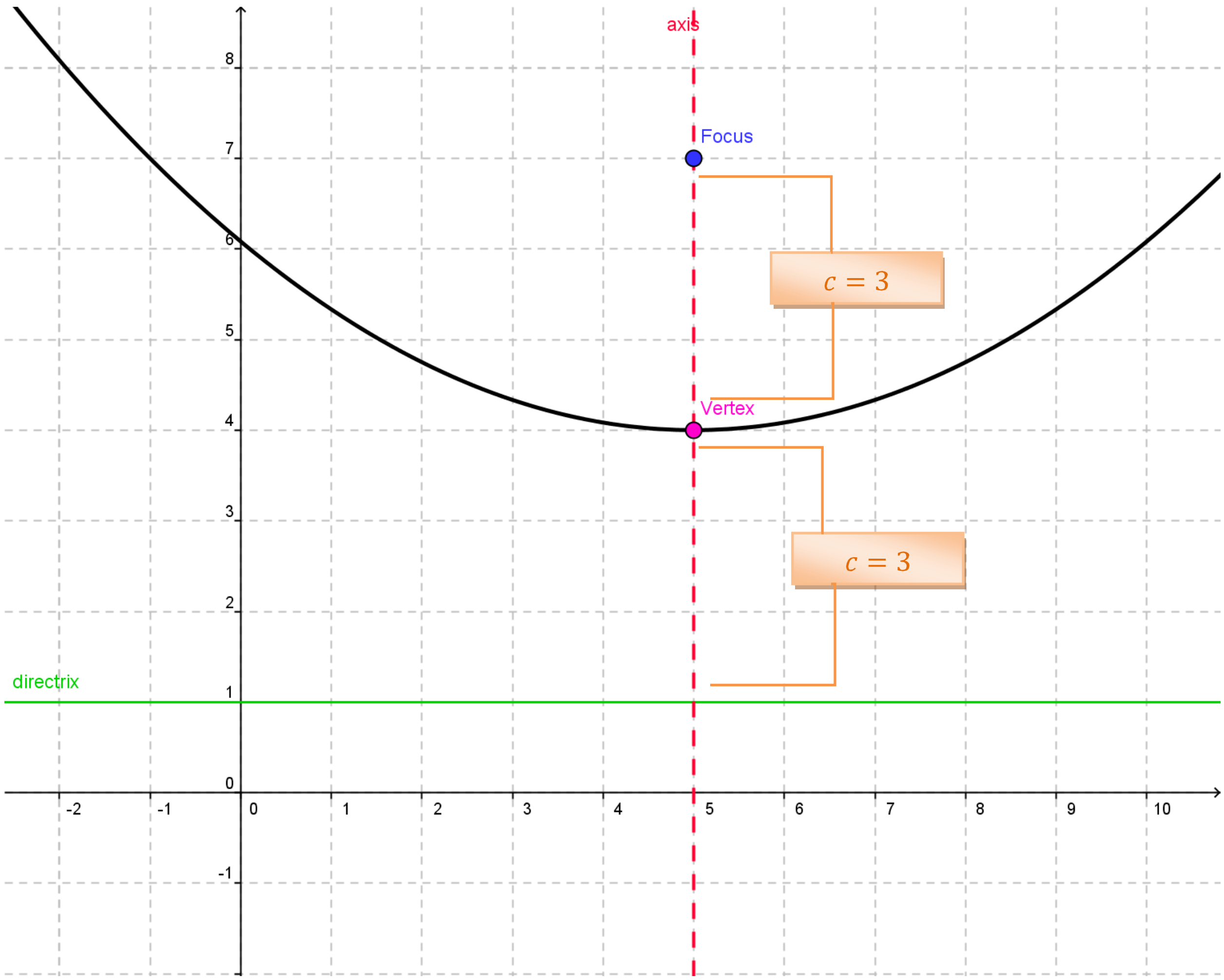
Vertex: $(\boldsymbol{h}, \boldsymbol{k})$
[x always goes with h; y always goes with k]

Let's look at some parabola equations…

UP parabola equation

$$y - k = a(x - h)^2$$

Since this is an UP parabola equation, you are guaranteed that a **is positive**.



The axis of symmetry is the vertical line $x = h$. In this example, it is $x = 5$.

In this example, $c = 3$. We know that $a = \frac{1}{4c}$ and that a is positive, so $a = \frac{1}{12}$.

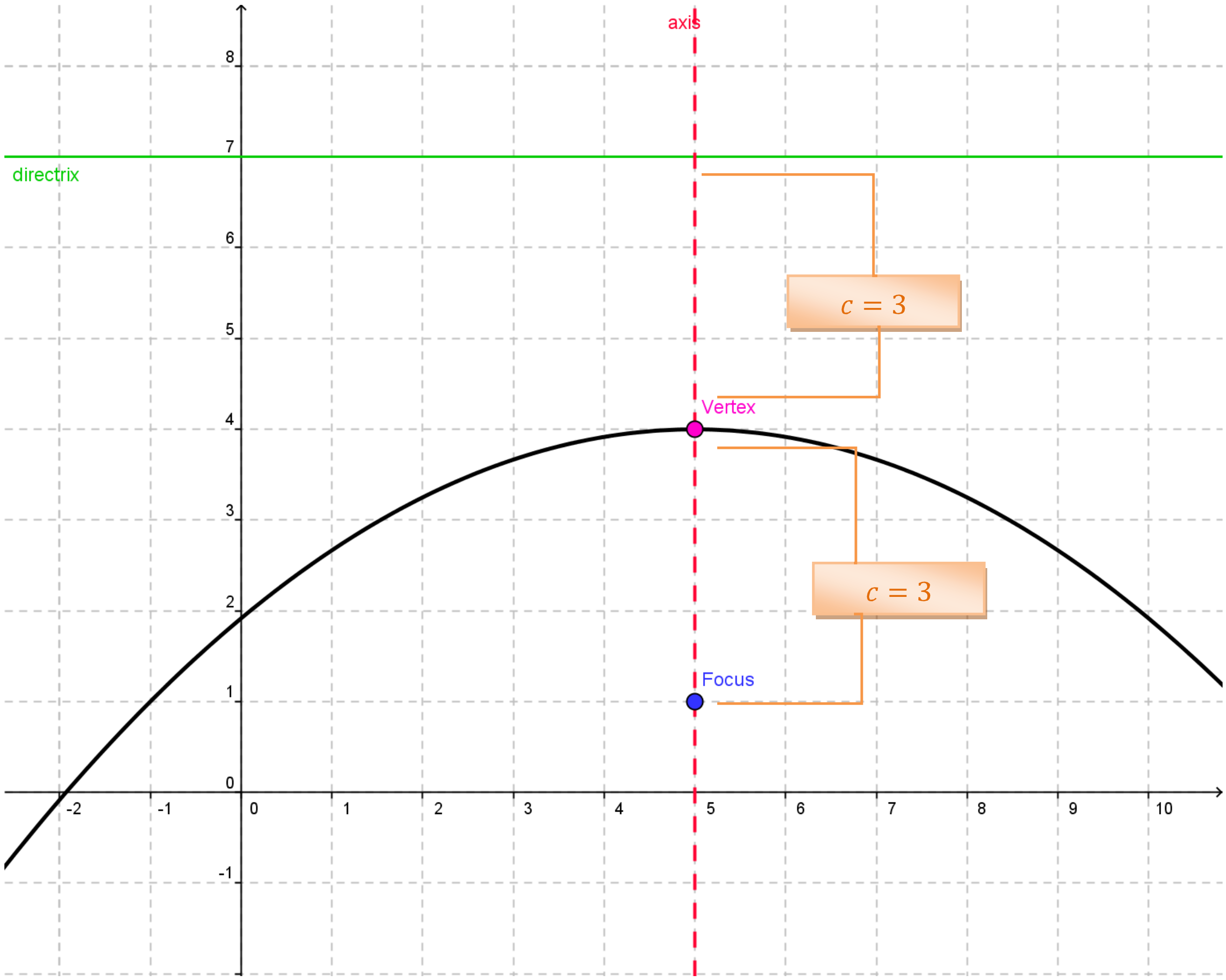
Our equation in this example is

$$y - 4 = \frac{1}{12}(x - 5)^2$$

DOWN parabola equation

$$y - k = a(x - h)^2$$

Since this is a DOWN parabola equation, you are guaranteed that a **is negative**.



The axis of symmetry is the vertical line $x = h$. In this example, it is $x = 5$.

In this example, $c = 3$. We know that $a = \frac{1}{4c}$ and that a is negative, so $a = -\frac{1}{12}$.

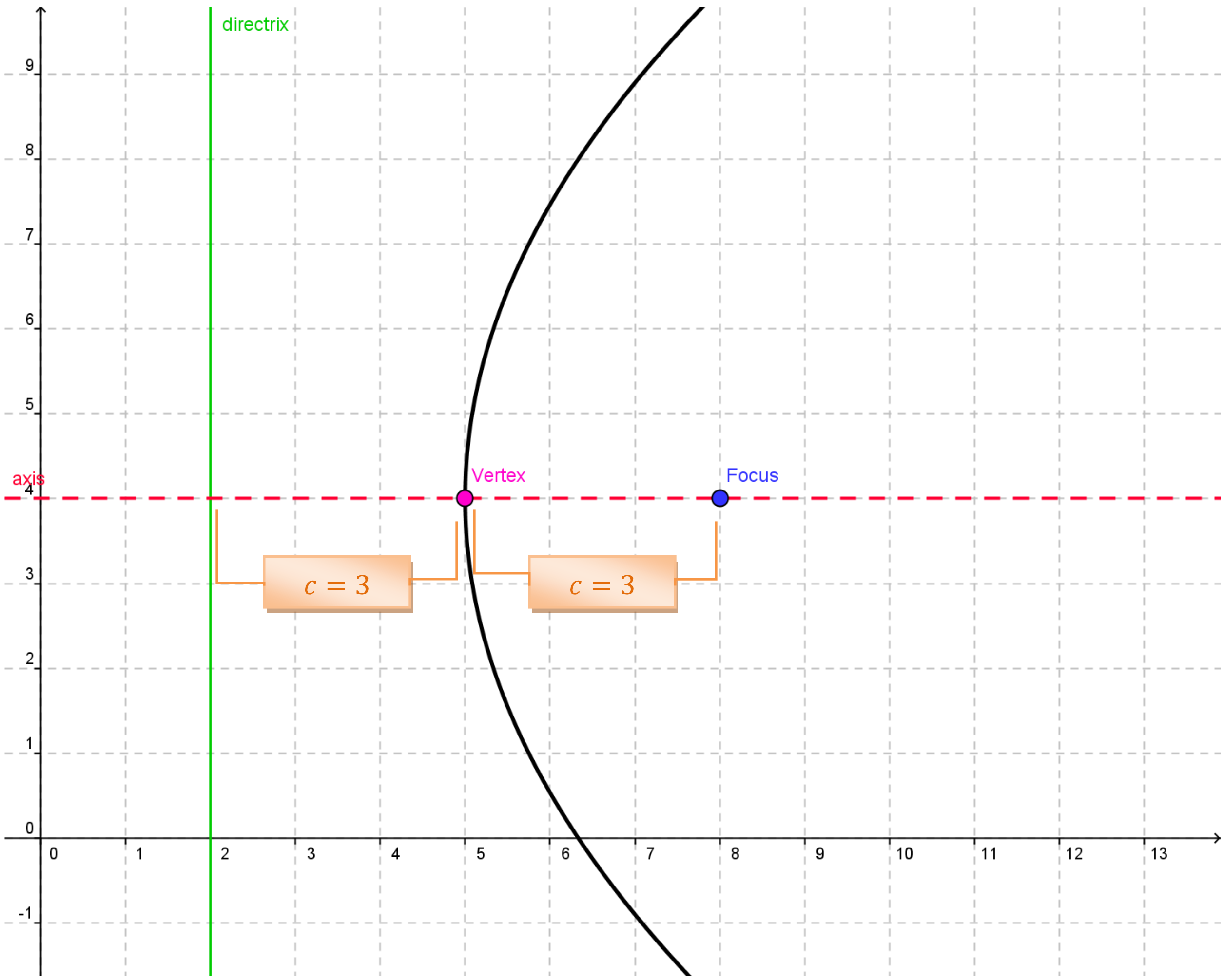
Our equation in this example is

$$y - 4 = -\frac{1}{12}(x - 5)^2$$

RIGHT parabola equation

$$x - h = a(y - k)^2$$

Since this is an RIGHT parabola equation, you are guaranteed that a **is positive**.



The axis of symmetry is the horizontal line $y = k$. In this example, it is $y = 4$.

In this example, $c = 3$. We know that $a = \frac{1}{4c}$ and that a is positive, so $a = \frac{1}{12}$.

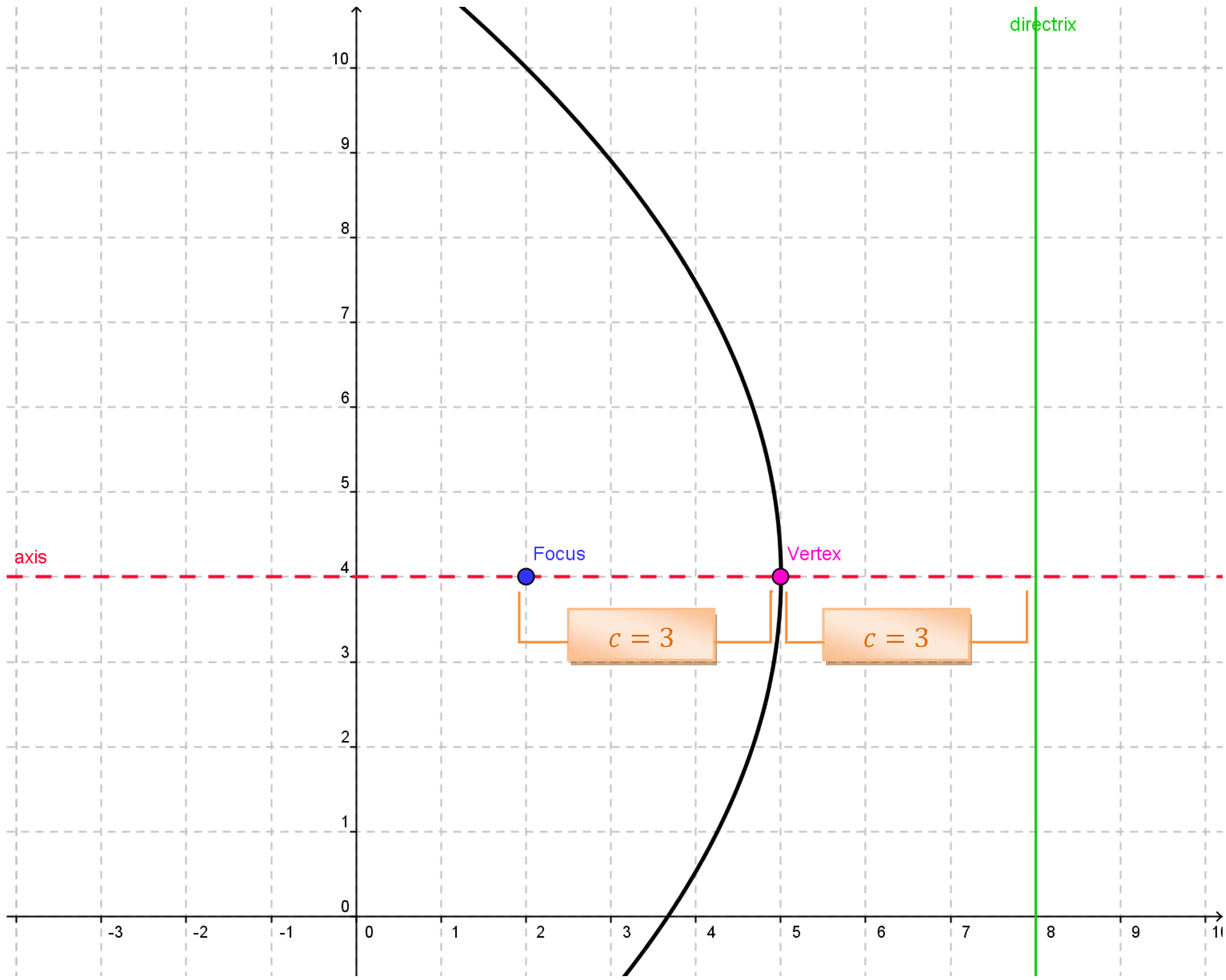
Our equation in this example is

$$x - 5 = \frac{1}{12}(y - 4)^2$$

LEFT parabola equation

$$x - h = a(y - k)^2$$

Since this is an LEFT parabola equation, you are guaranteed that ***a* is negative**.



The axis of symmetry is the horizontal line $y = k$. In this example, it is $y = 4$.

In this example, $c = 3$. We know that $a = \frac{1}{4c}$ and that a is negative, so $a = -\frac{1}{12}$.

Our equation in this example is

$$x - 5 = -\frac{1}{12}(y - 4)^2$$