

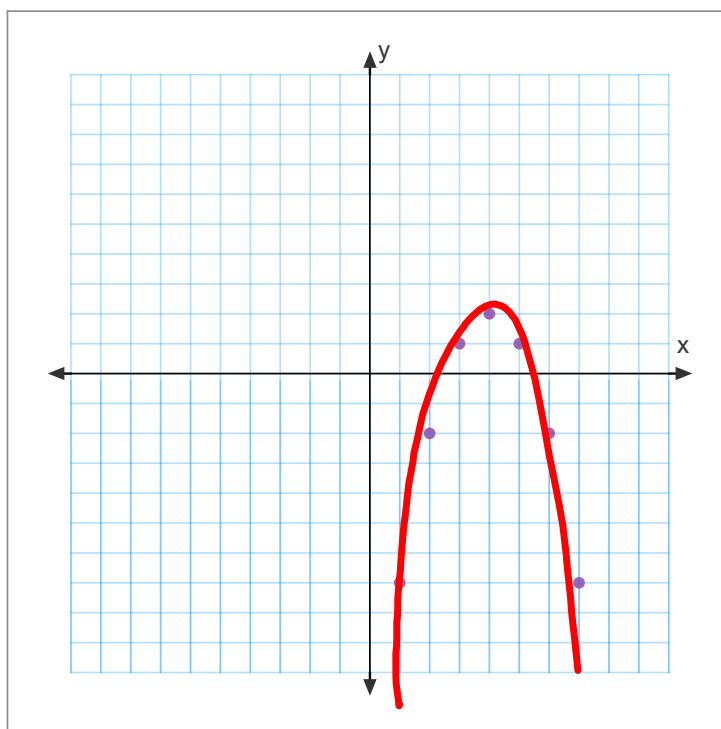
## Graphing a Second-Degree Function

Example:  $y = -(x-4)^2 + 2$

$a = -1$     $h = 4$     $k = 2$

vertex

x	y
1	-7
2	-2
4	2
5	1
6	-2

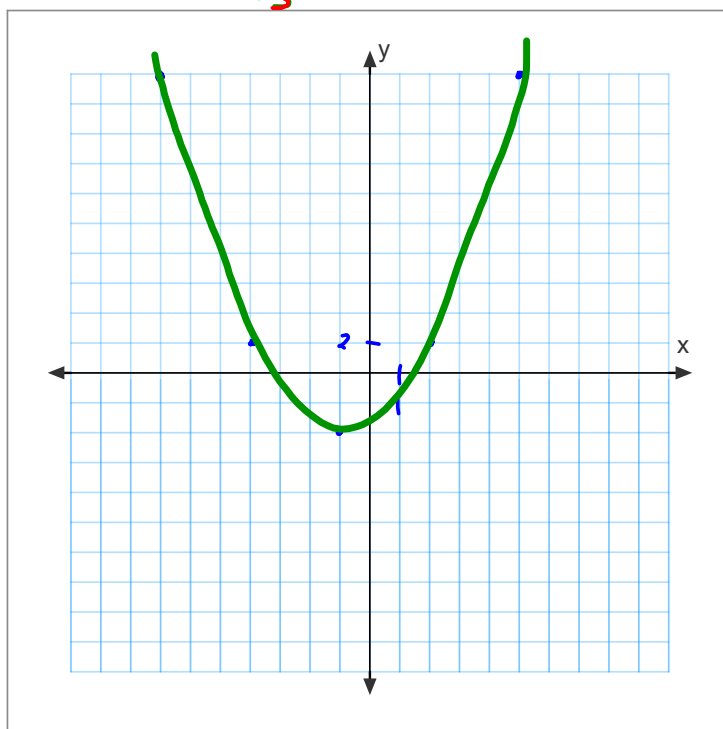


Example: Graph the function  $f(x) = \frac{2}{3}(x+1)^2 - 4$ .

$$a = \frac{2}{3} \quad h = -1 \quad k = -4$$

x	y
-10	50
-7	20
-4	2
-1	-4
2	2
5	20
8	50

vertex



## Finding the Rule of a Second-degree Function

- Given the vertex and a point

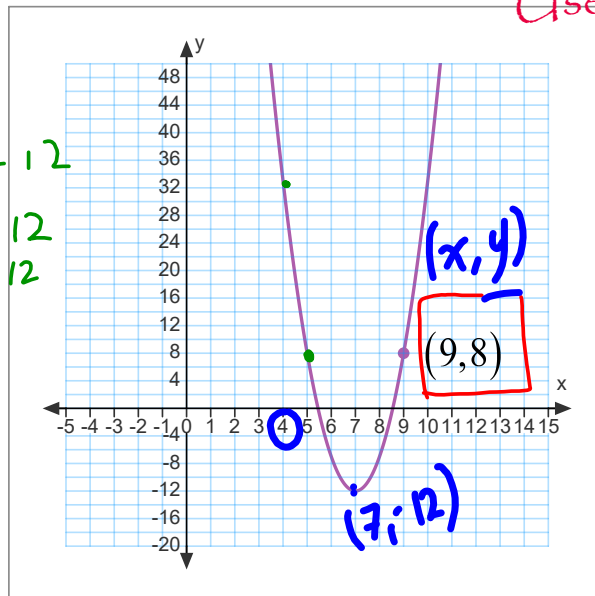
Example:

$$8 = a(2)^2 - 12$$

$$8 = 4a - 12$$

$$\frac{20}{4} = \frac{4a}{4}$$

$$5 = a$$



Use  $f(x) = a(x-h)^2 + k$  standard form

① vertex =  $(h, k)$   
fill them in

$$f(x) = a(x-7)^2 - 12$$

② Point  $(x, y)$ .  
fill them in

$$8 = a(9-7)^2 - 12$$

③ Solve for (isolate)  $a$

$$f(x) = 5(x-7)^2 - 12$$

**Example:** What is the equation of the second-degree function whose vertex is (11, 24) and passes through the point (6, 42)?

$$f(x) = a(x-h)^2 + k \quad \text{standard form}$$

$$f(x) = a(x-11)^2 + 24$$

$$42 = a(6-11)^2 + 24$$

$$42 = a(-5)^2 + 24$$

$$42 = 25a + 24$$

$$\begin{array}{r} -24 \\ -24 \end{array}$$

$$18 = 25a \quad \xrightarrow{\div 25} \quad a = \frac{18}{25} = 0.72$$

$$f(x) = \frac{18}{25}(x-11)^2 + 24 \quad \text{or} \quad f(x) = 0.72(x-11)^2 + 24$$

**Example:** What is the equation of the second-degree function whose vertex is  $V(-10, -2)$  and whose  $y$ -intercept is  $-12$ ?

The given point is  $P(0, -12)$ .

$$f(x) = a(x - h)^2 + k$$

$$f(x) = a(x + 10)^2 - 2$$

$$-12 = a(0 + 10)^2 - 2$$

$$-12 = a(10)^2 - 2$$

$$-12 = 100a - 2$$

$$-10 = 100a$$

$$\frac{-10}{100} = -\frac{1}{10} = -0.1 = a$$



$$f(x) = -\frac{1}{10}(x + 10)^2 - 2$$

Example: A second-degree function has the following properties:

Ran:  $]-\infty, 7]$   $\xrightarrow{k=7}$   $v(h, 7)$

Zeros:  $\{-1, 9\}$   $\xrightarrow{h=4}$   $v(4, 7)$

Axis of symmetry:  $x = 4$   $\xrightarrow{h=4}$   $v(4, 7)$

Determine the equation of this function.

$v(4, 7)$   $(-1, 0), (9, 0) \Rightarrow$  sl. form  $y = a(x-h)^2 + k$

$-7 = 25a$

$-0.28 = \frac{-7}{25} = a$

$0 = a(9-4)^2 + 7$

$0 = a(5)^2 + 7$

$0 = 25a + 7$

$$y = -\frac{7}{25}(x-4)^2 + 7$$