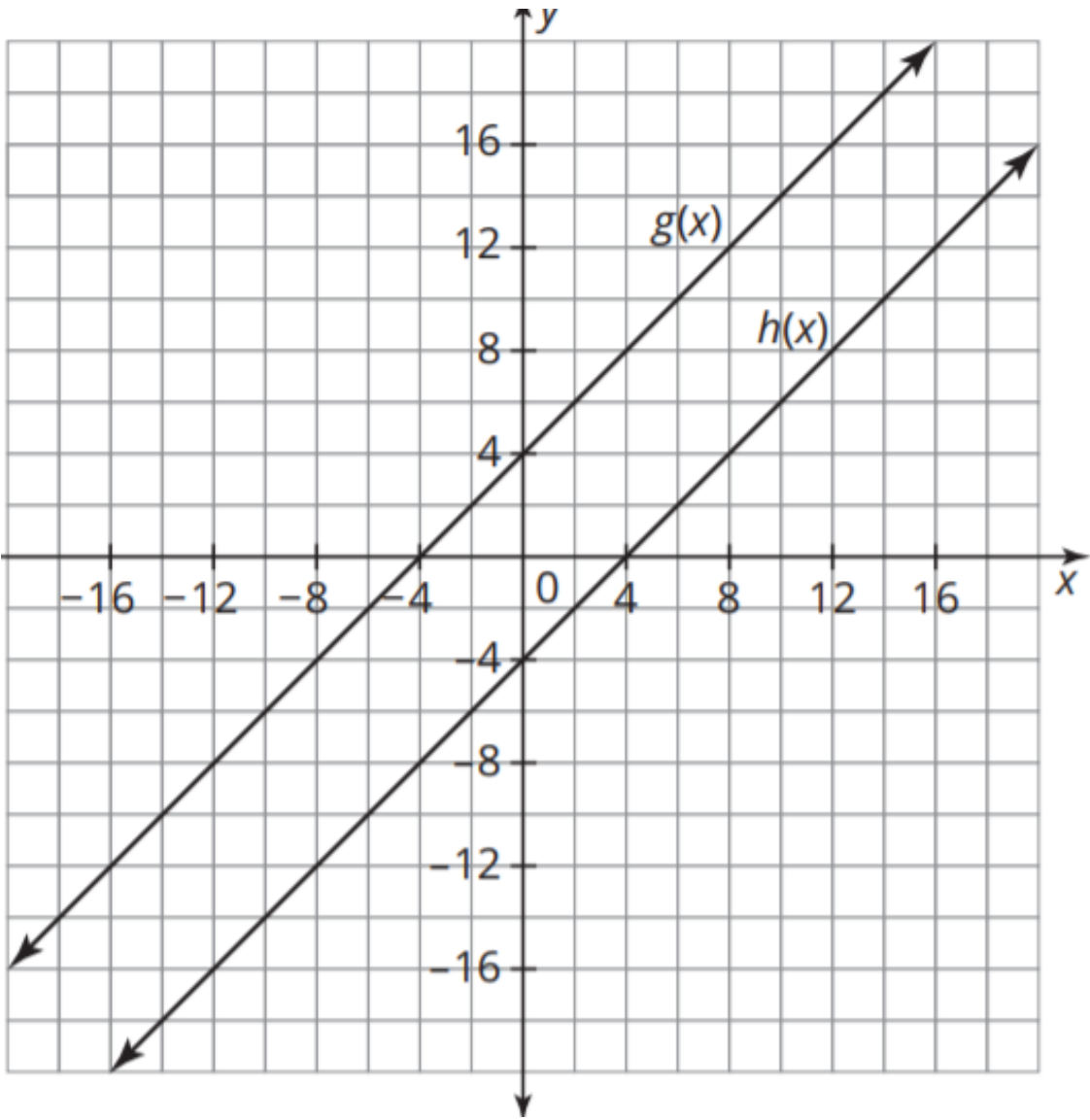


Recall that a quadratic function written in factored form is in the form $f(x) = a(x - r_1)(x - r_2)$, where $a \neq 0$. In factored form, r_1 and r_2 represent the x -intercepts of the graph of the function.

- 1. Determine the zeros of the function $z(x) = x^2 - 16$. Then, write the function in factored form.**



x	$g(x)$	$h(x)$	$z(x)$
			$x^2 - 16$
-4			
-2			
0			
2			
4			

The **Zero Product Property** states that if the product of two or more factors is equal to zero, then at least one factor must be equal to zero.

Worked Example

You can use the Zero Product Property to identify the zeros of a function when the function is written in factored form.

$$0 = x^2 - 16$$

$$0 = (x + 4)(x - 4)$$

Rewrite the quadratic as linear factors.

$$x - 4 = 0 \text{ and } x + 4 = 0$$

Apply the Zero Product Property.

$$x = 4$$

$$x = -4$$

Solve each equation for x .

Worked Example

You can determine the zeros of the function $f(x) = 9x^2 - 1$ by setting $f(x) = 0$ and using the Properties of Equality to solve for x .

$$9x^2 - 1 = 0$$

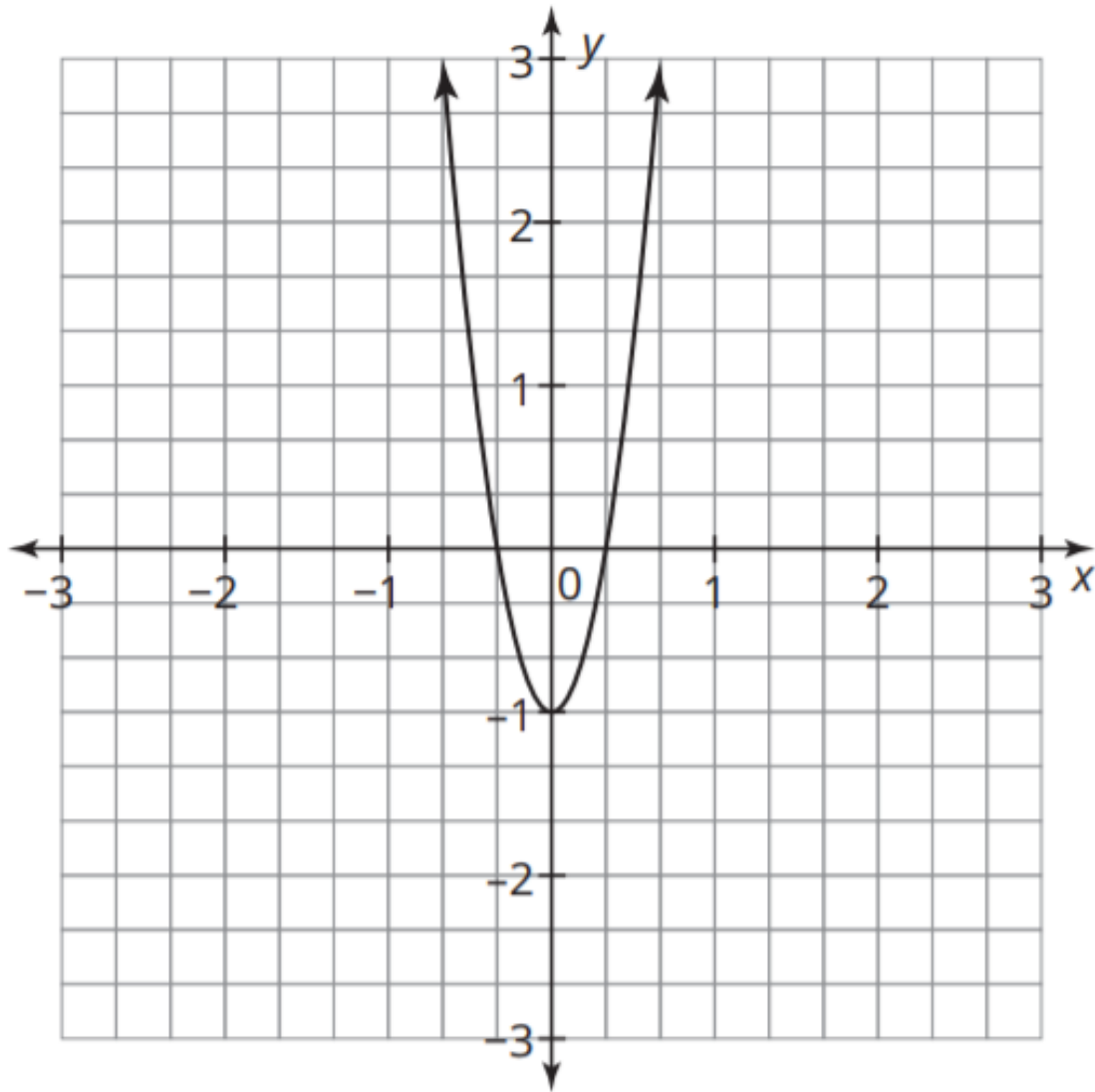
$$9x^2 = 1$$

$$x^2 = \frac{1}{9}$$

$$x = \pm\frac{1}{3}$$

You can then use the leading coefficient of 9 and the zeros at $\frac{1}{3}$ and $-\frac{1}{3}$ to rewrite the quadratic function in factored form.

$$f(x) = 9\left(x - \frac{1}{3}\right)\left(x + \frac{1}{3}\right)$$



6. The graph of $f(x) = 9x^2 - 1$ is shown.

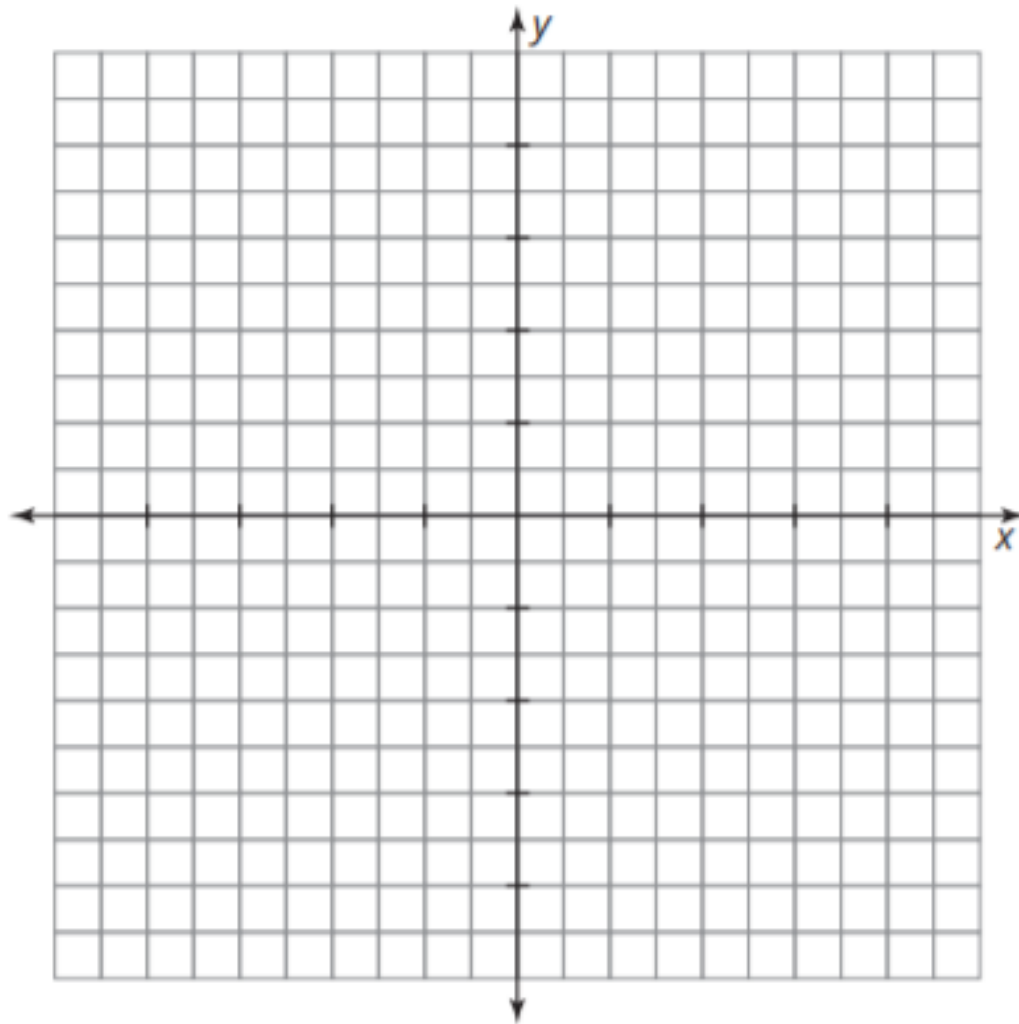
- Use Raychelle's function, $f(x) = (3x - 1)(3x + 1)$, to sketch a graph of the linear factors. Then use graphing technology to verify that $9x^2 - 1 = (3x - 1)(3x + 1)$.
- How do the zeros of the function relate to its two linear factors?

7. For each function:

- Sketch a graph. Label the axis of symmetry and the vertex.
- Use the Properties of Equality to identify the zeros, and then write the zeros in terms of their respective distances from the line of symmetry.
- Use what you know about the difference of two squares to rewrite each quadratic as the product of two linear factors. Then use the Zero Product Property to verify the values of x , when $f(x) = 0$.
- Use graphing technology to verify that the product of the two linear factors is equivalent to the given function.

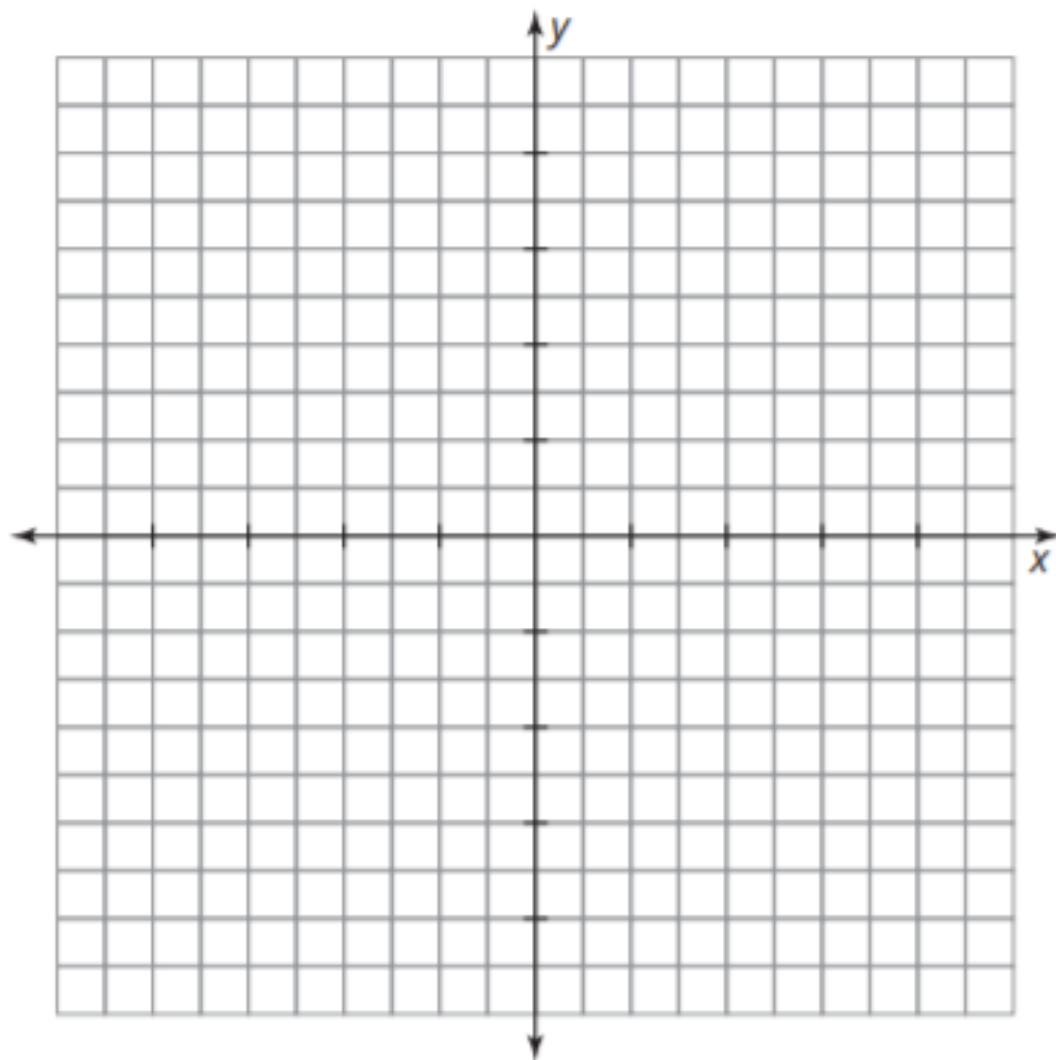
a. $f(x) = 4x^2 - 9$

M4-43



b. $f(x) = x^2 - 2$

M4-43



c. $f(x) = 25x^2 - 1$

M4-43

