

Warm Up

Describe the transformations to the graph of the basic function $f(x) = x^2$ given each equation.

1. $y = (x - 4)^2$

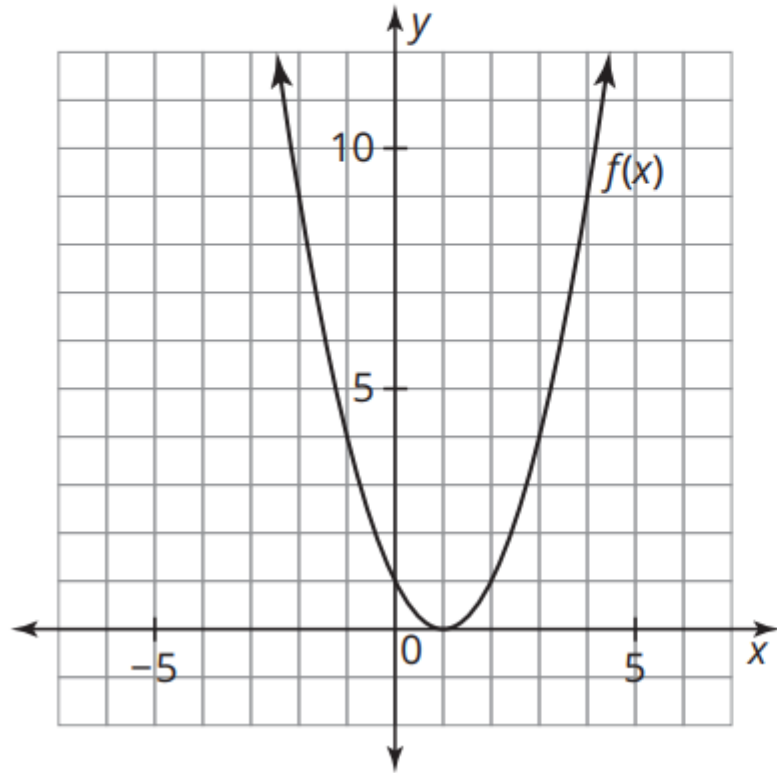
2. $y = \frac{1}{2}(x + 1)^2$

3. $y = -(10 + x)^2 - 3$

4. $y = (8 + x)^2 + 1$

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The coordinate plane shows the graph of the function $f(x) = (x - 1)^2$.



1. Describe the transformation applied to the basic function $f(x) = x^2$ that produces the graph of this function.

Lindsay



$$0 = (x - 1)^2$$

$$0 = (x - 1)(x - 1)$$

The Zero Product Property says that one or both of the factors is equal to 0.

So, $x = 1$.

The equation has a double root at $x = 1$.

Casey



$$(x - 1)^2 = 0$$

$$\sqrt{(x - 1)^2} = \sqrt{0}$$

$$\pm(x - 1) = 0$$

$$+(x - 1) = 0$$

$$x = 1$$

$$-(x - 1) = 0$$

$$-x + 1 = 0$$

$$-x = -1$$

$$x = 1$$

The only unique solution for $y = 0$ is $x = 1$.

Worked Example

Consider the equation $(x - 1)^2 = 9$.

You can use the Properties of Equality to determine the solutions to an equation in this form.

First take the square root of both sides of the equation and then isolate x .

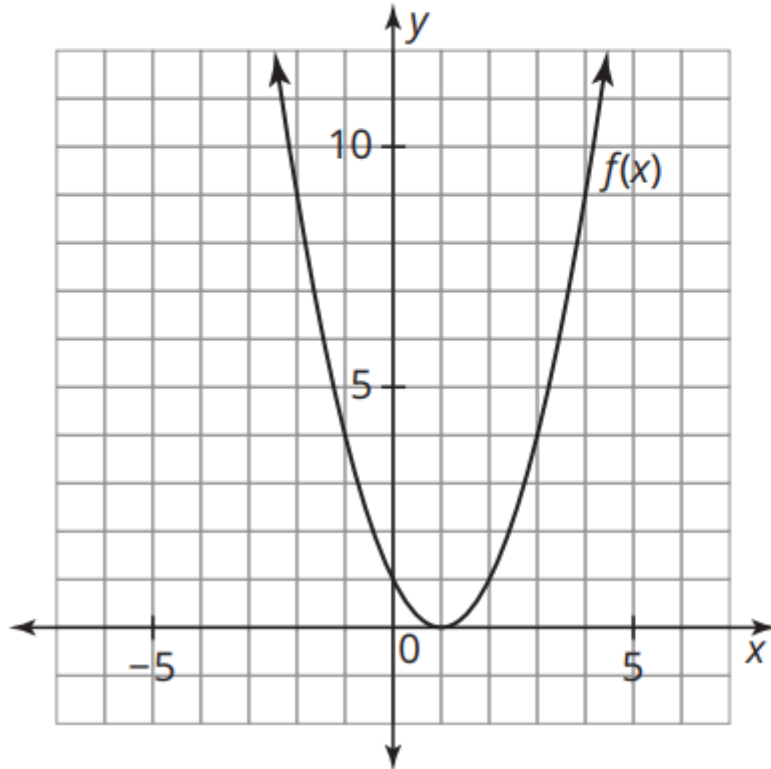
$$(x - 1)^2 = 9$$

$$\sqrt{(x - 1)^2} = \sqrt{9}$$

$$x - 1 = \pm 3$$

$$x = 1 \pm 3$$

2. For each equation, show the solutions on the graph and interpret the solutions in terms of the axis of symmetry and the points on the parabola. Then write the solutions.



a. $(x - 1)^2 = 4$

b. $(x - 1)^2 = 5$

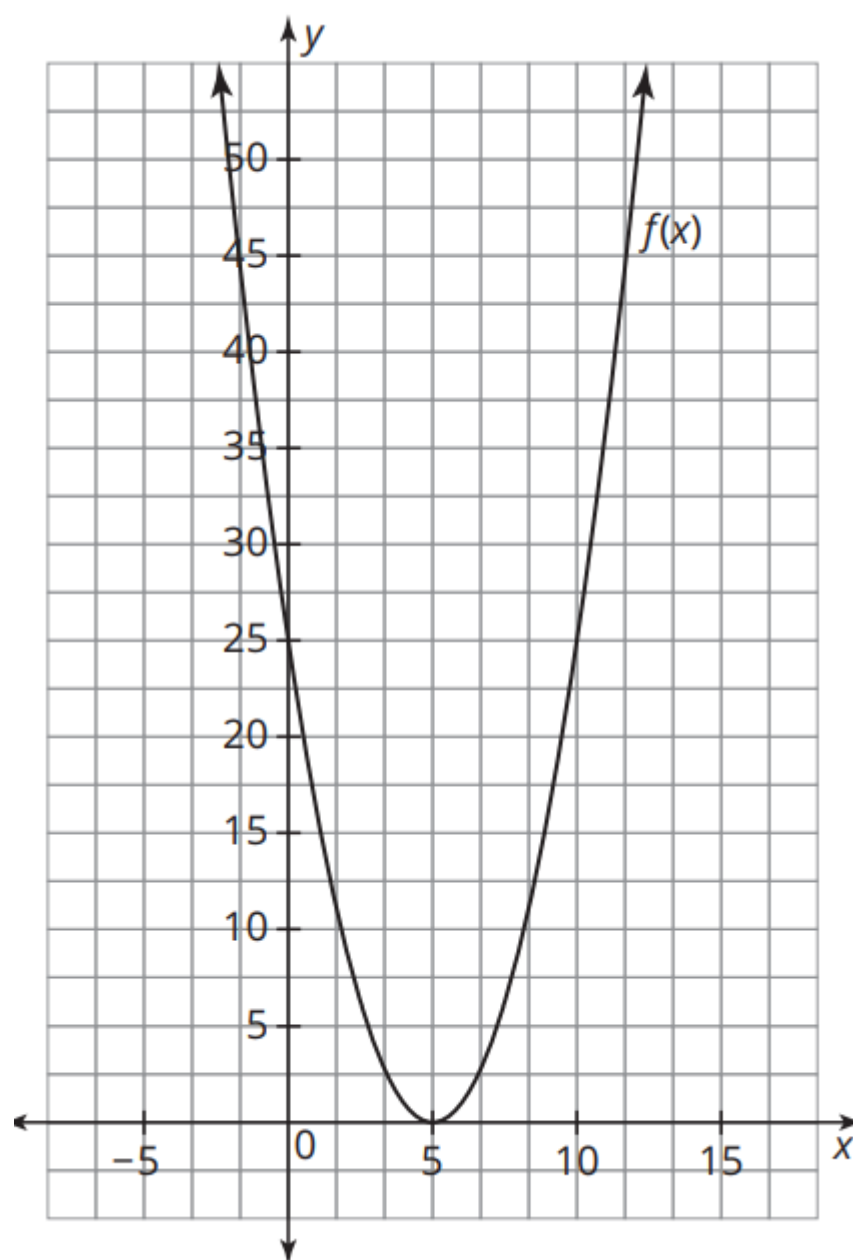
3. Determine the exact and approximate solutions for each of the given equations.

a. $(r + 8)^2 = 83$

b. $(17 - d)^2 = 55$

1. Consider the function $f(x) = (x - 5)^2$.

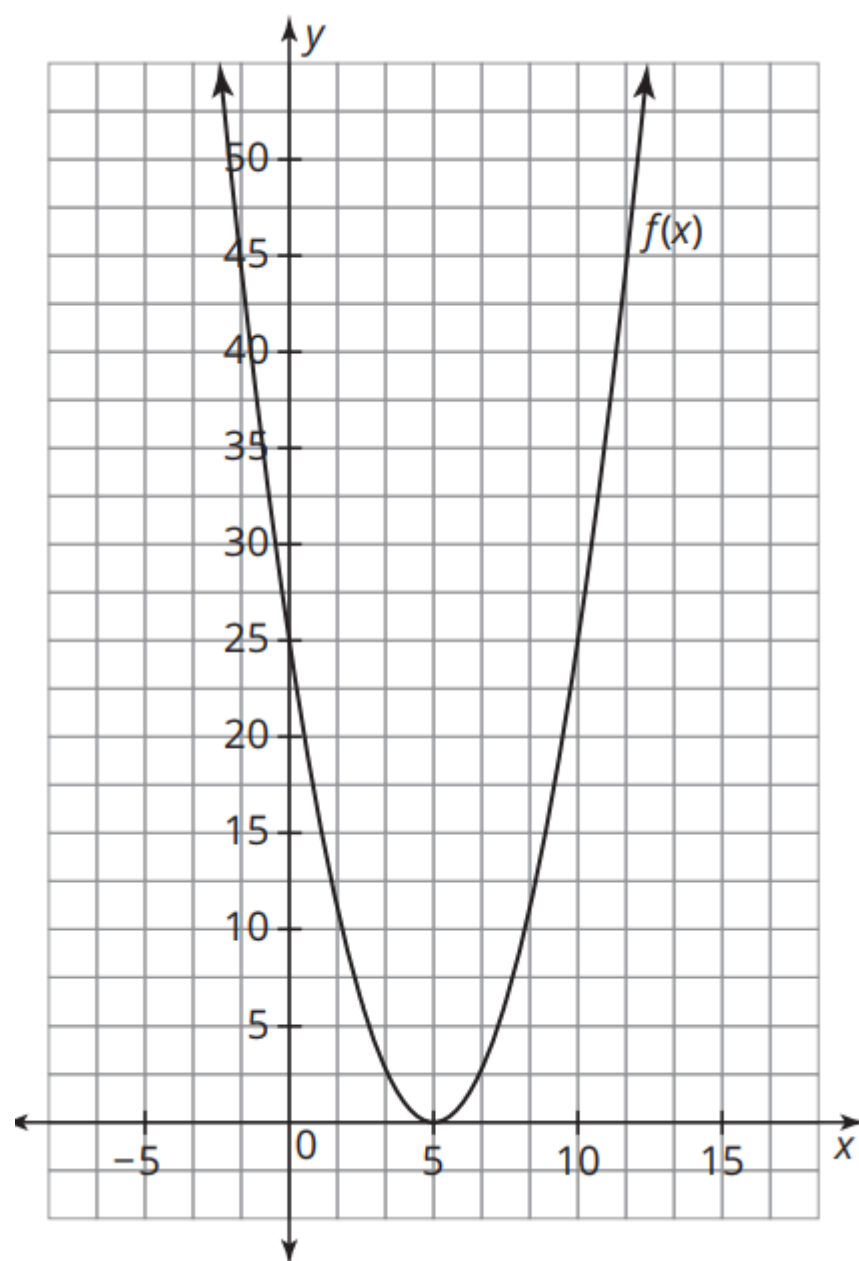
- Determine the solutions to $0 = (x - 5)^2$.
Solve algebraically and label the solution on the graph.
- Interpret your solutions in terms of the axis of symmetry and the parabola $y = (x - 5)^2$.
- Describe the zeros of this function.



Now let's add a dilation factor.

2. Consider the function $g(x) = 2(x - 5)^2$.

- a. Write $g(x)$ in terms of $f(x)$ and describe the transformation.**
- b. Sketch a graph on the same coordinate plane as $f(x)$.**
- c. How have the zeros changed from $f(x)$ to $g(x)$?**



5. Solve each quadratic equation. Give both exact and approximate solutions.

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

b. $2(x - 1)^2 = 18$

c. $-2(x - 1)^2 = -18$

d. $4(x + 5)^2 = 21$

e. $-\frac{1}{2}(x + 8)^2 = -32$

f. $\frac{2}{3}(12 - x)^2 = 1$