

Objective: Solve a Quadratic Equation by Graphing Two Functions

Concept

Steps to Solve an Equation Graphically Using Two Functions

1. Create two functions, $f(x)$ and $g(x)$ using the left and right sides of the equation.
2. Graph the functions and determine the point of intersection. This corresponds to where $f(x) = g(x)$. **The x -coordinate of the point(s) of intersection will be the solution to the equation,** because this is the value of x where the two functions are equal in value.
3. State the solution of the equation.



Objective: Solve a Quadratic Equation by Graphing Two Functions

Concept

Solve the quadratic equation $2(x - 4)^2 - 2 = 0$ using the graphs of two functions.

1. Create two functions from the equation.

$$\begin{array}{r} 2(x - 4)^2 - 2 = 0 \\ \quad \quad \quad +2 \quad +2 \\ \hline 2(x - 4)^2 = 2 \end{array}$$

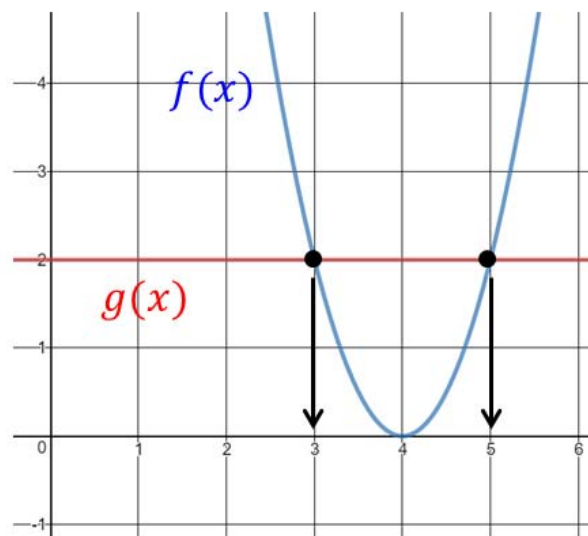
↓

$$\text{let } f(x) = 2(x - 4)^2$$

$$\text{let } g(x) = 2$$

Now, $2(x - 4)^2 = 2$ means the same thing as where $f(x) = g(x)$.

2. Graph $f(x)$ and $g(x)$.



3. Using the graph, determine the values of x where the functions are equal.

Since $f(x) = g(x)$ at $x = 3$ and $x = 5$, **the solutions to the equation $2(x - 4)^2 - 2 = 0$ are $x = 3$ and $x = 5$.**

Objective: Solve a Quadratic Equation by Graphing Two Functions

Ex) Solve the quadratic equation by using the graphs of two functions. Write and graph the two functions. State the solutions to the equation.

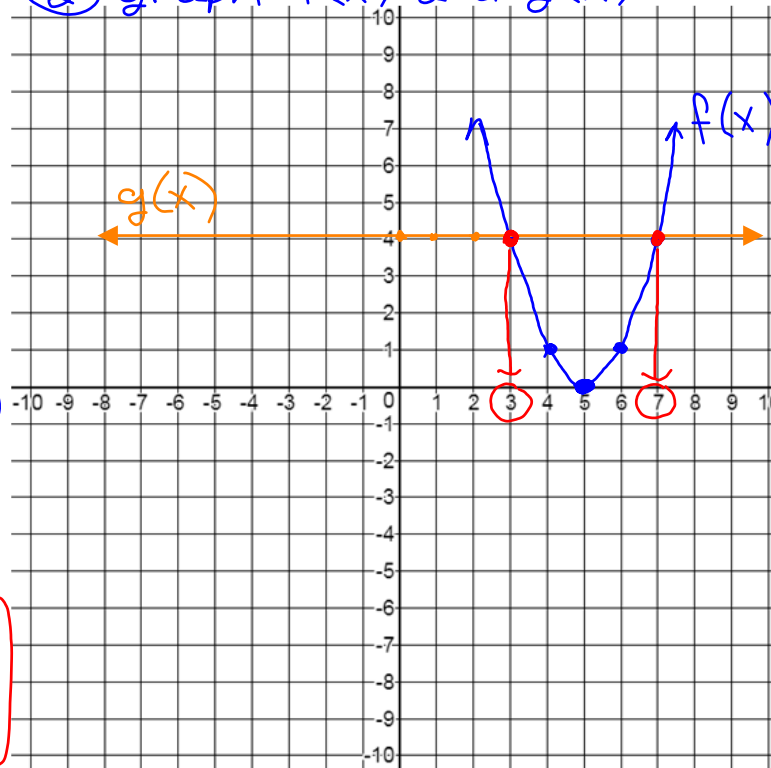
~~1~~ $(x - 5)^2 - 4 = 0$

① $(x-5)^2 = 4$
 +4 +4
 (a) (b)

② $f(x) = (x-5)^2$ vertex $(h,k) = (5,0)$

$g(x) = 4 \rightarrow y = 4$
 horiz. line

② graph $f(x)$ and $g(x)$



③ Solution(s): to $(x-5)^2 - 4 = 0$
 are $x = 3$ and $x = 7$

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Ex) Solve the quadratic equation by using the graphs of two functions. Write and graph the two functions. State the solutions to the equation.

② graph $f(x)$ and $g(x)$

$$-2(x + 3)^2 - 2 = 0$$

①

$$\frac{-2(x+3)^2 + 2 + 2}{-2(x+3)^2 = 2}$$

(a) (b)

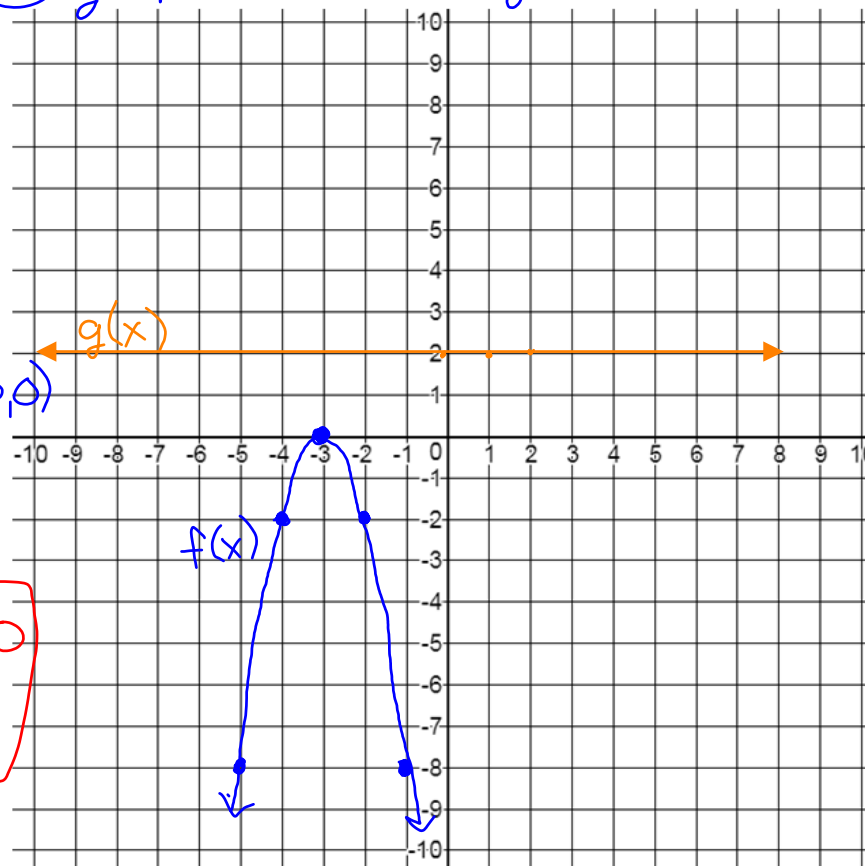
③

$$f(x) = -2(x+3)^2 \quad \text{vertex } (h,k) = (-3, 0)$$

④

$$g(x) = 2 \rightarrow y = 2 \text{ horiz. line}$$

⑤ Solution(s): to $-2(x+3)^2 - 2 = 0$
has no real number solutions



Objective: Solve a Quadratic Equation by Graphing Two Functions

Ex) Solve the quadratic equation by using the graphs of two functions. Write and graph the two functions. State the solutions to the equation.

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

①

$$\begin{array}{r} +9 \quad +9 \\ \hline (x-1)^2 = 9 \\ \text{---} \quad \text{---} \\ \text{a} \quad \text{b} \end{array}$$

②

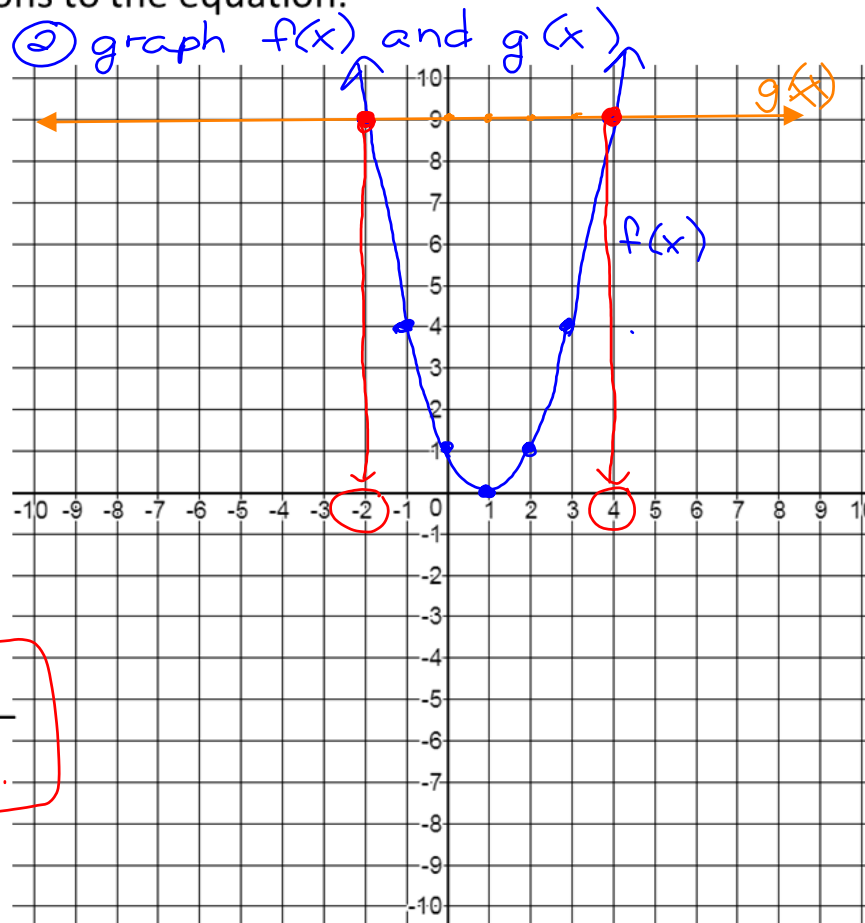
$f(x) = (x-1)^2$ vertex $(h,k)=(1,0)$

③

$g(x) = 9 \rightarrow y = 9$
horiz. line

④

Solution(s): ~~to~~ $(x-1)^2 - 9 = 0$
are $x = -2$ and $x = 4$.



Objective: Solve a Quadratic Equation by Graphing Two Functions

Closure

Jessica solved the quadratic equation $(x - 3)^2 - 5 = 0$ using the graphs of two functions. Her graph is shown. She says the equation has imaginary solutions. Is she correct? Explain your reasoning.

Jessica is incorrect. The second function would be $g(x) = 5$, not $g(x) = -5$, which is what Jessica graphed. The solutions would be in the intervals $[0,1]$ and $[5,6]$.

