

4.23

Horizontal Translation of the Graph of a Function

• Example 1

Define the function f whose graph results from shifting the graph of $g(x) = -x^2 + 2$ to the left by 3 units.

If (a, b) is on the graph of $g(x)$, $(a - 3, b)$ is on the graph of the translation of g . We want to represent the translation of g as a new function $f(x)$. Therefore, we need to add 3 to the x values of g in order to obtain f . That is

$$f(x) = g(x + 3) = -(x + 3)^2 + 2 = -x^2 - 6x - 7, \text{ thus } f(x) = -x^2 - 6x - 7.$$

• • • CHECK YOURSELF

Define the function f whose graph results from shifting the graph of $g(x) = -x^2 - 4$ to the left by 2 units.

• • • CHECK YOURSELF ANSWER

1. $f(x) = -x^2 - 4x - 8.$

4.23 Exercises

Name _____

Section _____

Date _____

A N S W E R S

1. _____

2. _____

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12. _____

For each of the following functions, define the function f whose graph results from a horizontal shift of the graph of the given function by the specified amount.

1. $g(x) = x^2 + 2$, 1 unit to the left

2. $h(x) = -x^2$, 3 units to the right

3. $y(x) = -x^2 - 9$, 2 units to the right

4. $m(x) = -x^2 - x$, 1 unit to the left

5. $g(x) = -x^2 + x + 1$, 2 units to the left

6. $k(x) = x^2 + 9x + 1$, 1 unit to the right

7. $h(x) = -2x^2 - 3$, 2 units to the left

8. $j(x) = -3x^2$, 3 units to the right

9. $y(x) = 2x^2 - x$, 4 units to the right

10. $n(x) = -x^2 + 4$, 2 units to the left

11. $g(x) = x^2 - 3$, 1 unit to the left

12. $m(x) = -x^2 - 6$, 3 units to the right