UNIT 3 • MODELING AND ANALYZING QUADRATIC FUNCTIONS
Lesson 4: Transforming Functions

Practice 3.4.1: Replacing $f(x)$ with $f(x) + k$ and $f(x + k)$ A

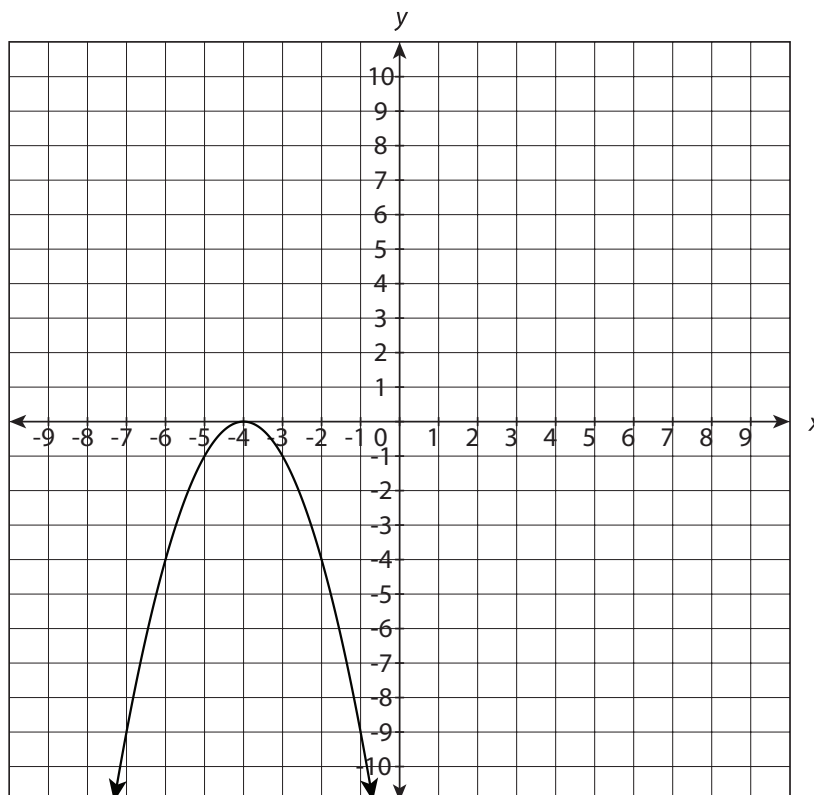For problems 1–3, let $f(x) = x^2$. Write a function that translates $f(x)$ as described.

1. 2 units to the left

2. 3 units up

3. 5 units to the right and 2 units down

For problems 4–6, let $f(x) = x^2$. Graph $g(x)$ by translating the graph of $f(x)$. State the vertex of the translated function.

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

5. $g(x) = x^2 - 4$

6. $g(x) = (x - 5)^2 - 2$

Use what you know about translations of functions to solve each problem.

7. The following graph is a translation of $f(x) = -x^2$. Write an equation for the graph and state the value of k that was used to transform the function.

8. A mother and her daughter went golfing. The mother hit first. Her ball followed the path modeled by the equation $f(x) = -0.0009x^2 + 0.2088x$ in the direction of the hole, and landed 18 yards short of the hole. The daughter teed off 18 yards closer to the hole because she is a beginner. She realized that if she could hit the ball on the same trajectory as her mother, her ball would land right by the hole. What is the equation that describes the path that the daughter's ball should follow?

9. A basketball is thrown from a height of 4 feet so that its path is modeled by the function $f(x) = -0.03x^2 + 1.3x + 4$. If the exact same shot is taken from a balcony that is 12 feet above where the original shooter was standing, how far away will the ball hit the ground? What is the equation that models this shot?

10. Simon has a toy that launches hollow plastic balls. The launched balls always follow a path modeled by the function $f(x) = -\dfrac{1}{8}(x-8)^2 + 8$ when the launcher is at the "origin." If the launcher is lifted up 2 feet and moved forward 5 feet, will a launched ball land in a basket that is on a 4-foot high stool 20 feet from the origin? What is the function that models this new launcher position?