

Algebra 2 • Unit 6 Worksheet

Transformations of Functions

Name: _____

Date: _____

This unit treats functions as objects that can be translated, reflected, and scaled. You'll learn to read transformations from equations like $g(x) = a \cdot f(b(x - h)) + k$ and to apply them to fit a model to data.

Part A • Translation

1. Let $f(x) = x^2$. Describe each transformation in words AND state the vertex.

a. $g(x) = f(x) + 4$ Words: _____ Vertex: _____

b. $h(x) = f(x - 3)$ Words: _____ Vertex: _____

c. $k(x) = f(x + 2) - 5$ Words: _____ Vertex: _____

d. Why does $f(x - 3)$ shift RIGHT 3 (not left)? Explain.

Part B • Reflection and Symmetry

2. For each function, decide if it is EVEN, ODD, or NEITHER. Justify algebraically.

a. $f(x) = x^4 - 3x^2$ Type: _____ Why?

b. $g(x) = x^3 - x$ Type: _____ Why?

c. $h(x) = x^2 + x$ Type: _____ Why?

d. What does each kind of symmetry mean GEOMETRICALLY?

Part C • Vertical and Horizontal Scaling

3. Let $f(x)$ be a known function. Describe what each does to the graph.

- a. $2 \cdot f(x)$: _____
- b. $f(2x)$: _____
- c. $(1/3) \cdot f(x)$: _____
- d. $f(x/3)$: _____
- e. Why do horizontal and vertical scale factors work in OPPOSITE ways (multiplication vs. division)?

Part D • Build an Equation

4. A function $f(x)$ is shown with key points $(0, 0)$, $(1, 1)$, $(2, 4)$, $(3, 9)$. Write an equation for each transformation.

- a. g shifts f UP 5 and LEFT 2. $g(x) =$ _____
- b. h reflects f over the x -axis, then stretches vertically by 3. $h(x) =$ _____
- c. p is f reflected over the y -axis. $p(x) =$ _____
- d. q compresses f horizontally by a factor of 2 and shifts UP 1. $q(x) =$ _____

Part E • Reading a Graph

5. Sketch $g(x)$ given f and a description.

- a. $f(x) = |x|$. Sketch $g(x) = -|x - 4| + 3$ by transforming f .
- b. List the sequence of transformations applied to f to get g .

<i>Sketch BOTH $f(x)$ (the original) and $g(x)$ (the transformed) on the same axes. Label each.</i>

Part F • Modeling with Transformations

6. A diver's height (in feet) above water is modeled by $h(t) = -16t^2 + 24t + 6$, where t is in seconds.

a. Rewrite $h(t)$ in vertex form by completing the square.

b. What is the vertex? What does it tell you about the dive?

c. How does h relate to the parent function $f(t) = t^2$? Describe the transformations.

Part G • Error Analysis

7. Mai wrote: " $f(x + 5)$ shifts the graph 5 units to the RIGHT." Is she correct?

☐ Yes ☐ No — Test with $f(x) = x^2$ and the point $(0, 0)$. What happens to it under $f(x + 5)$?

8. Han claims: "The function $f(x) = x^3 + 1$ is odd because x^3 is odd." Test this.

Compute $f(2)$ and $f(-2)$. Is $f(-2) = -f(2)$?

Conclusion — even, odd, or neither? Why?

Part H • Two-Method Probe

9. The point $(4, 9)$ is on the graph of $f(x)$. Find the corresponding point on $g(x) = 2 \cdot f(x - 1) + 5$ using TWO approaches.

Method 1: Plug in carefully	Method 2: Trace the transformations

Did both methods give the same point? What is it?

Part I • Open Reflection

10. Why is it useful to study transformations of ALL function types together (instead of separately for quadratics, exponentials, etc.)?
