

Name _____ Date _____ Period _____

Transformations of $f(x) = |x|$, Part II

TEACHER KEY | Algebra II | Unit 2 | Day 3 | TEK A2.6.C

Objective: I can describe and graph the effect of c and d on $f(x) = a|x-c|+d$, and combine all four transformations into one function.

Vocabulary

Horizontal shift: $f(x-c)$ moves the graph left/right, **opposite** the sign of c .

Vertical shift: $f(x)+d$ moves the graph up/down, **the same as** the sign of d .

KEY IDEA

For $f(x) = a|x - c| + d$, the vertex is always at **(c , d)**.

c shifts horizontally, **OPPOSITE** its sign: $x - 3 \rightarrow$ right 3, $x + 2 \rightarrow$ left 2.

d shifts vertically, **SAME** as its sign: $+4 \rightarrow$ up 4, $-5 \rightarrow$ down 5.

Let's Work Through It

Example 1 — Give the shift and vertex of $f(x) = |x - 3|$.

Shift: **right 3** Vertex: **(3, 0)**

Example 2 — Give the shift and vertex of $f(x) = |x + 2|$.

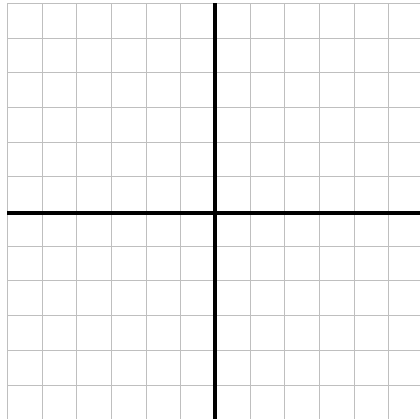
Shift: **left 2** Vertex: **(-2, 0)**

Example 3 — Give the vertex of $f(x) = |x| + 4$, then the vertex of $f(x) = |x| - 5$.

$f(x) = |x| + 4$: **(0, 4)** $f(x) = |x| - 5$: **(0, -5)**

Example 4 — "Compressed by $1/3$, shifted down 5, shifted left 2" - write it as one function, give its vertex, then graph it. Each square is 1 unit; both axes run -6 to 6.

$f(x) = (1/3)|x + 2| - 5$ Vertex: $(-2, -5)$



Example 5 — Dunhill Drafting's roofline was modeled by $f(x) = -1.2|x - 3| + 8$. Give the vertex (the roof's highest point) and describe the transformations.

Vertex: $(3, 8)$

Transformations: **stretched by 1.2, reflected over the x-axis, shifted right 3 and up 8**

Your Turn

You Try 1 — Give the vertex of $f(x) = -2|x - 1| + 6$, and describe its transformations from the parent.

Vertex: $(1, 6)$

Transformations: **vertical stretch by 2, reflected over the x-axis, shifted right 1 and up 6**

You Try 2 — True or False: every function of the form $a|x - c| + d$ has the SAME shape as the parent, just moved and resized. Explain.
