

Transformations of the Parent Function Day 2

Unit 2

Essential Question: How do the constants multiplied in an equation affect the graph of a line? Answer on your response card.

Lesson 8

Yesterday we learned how adding or subtracting a number affects a function causing translations. Today we will learn about stretches and shrinks in a function.

Vertical Stretch ($a > 1$) by a factor of a
Vertically Compressed ($0 < a < 1$) by a factor of a
 (x-intercept stays the same)

Reflection over x-axis if a is negative

Vertical shift
 If you see a "plus k ", go **up** $\uparrow k$ units
 If you see a "minus k ", go **down** $\downarrow k$ units

Reflection over y-axis if b is negative

Horizontal Stretch ($0 < b < 1$) by a factor of $1/b$
Horizontally Compressed ($b > 1$) by a factor of $1/b$
 (y-intercept stays the same)

Horizontal shift
 If you see a "plus h ", go **left** $\leftarrow h$ units
 If you see a "minus h ", go **right** $\rightarrow h$ units

$$g(x) = a * f(bx - h) + k$$

For each of the following, describe the transformation(s).

$-f(x)$ • reflected over x-axis

$f\left(\frac{1}{3}x\right)$ • horizontal stretch

$2f(x-5)$ • vertical stretch
(narrow/steep)

• Shift left 5

$-f(2x) - 3$

- reflection over x-axis
- Horizontally Compressed
- Shift Down 3

$\frac{1}{2}f(x+4) - 2$

- Vertical Compression
(flatter/wider)
- Shift left 4
- Shift Down 2

$f(3x-4) + 1$

- Horizontal Compressed
- Shift right 4
- Shift Up 1

For the questions below, describe the transformation, complete the tables, sketch the resulting graphs.

Use points from the linear parent function $y=x$

$$y = \frac{1}{2}f(x-1) - 3$$

$$y = -2f(x+1) + 5$$

$$y = f(2x) + 3$$

Describe: Vertical compress, right 1, down 3

Describe: Vertical stretch, reflection, left 1, up 5

Describe: Horizontal Compression, up 3

x	y
-4	+1 $\frac{1}{2}(4) - 3$
-1	+1 $\frac{1}{2}(1) - 3$
2	+1 $\frac{1}{2}(2) - 3$
4	+1 $\frac{1}{2}(4) - 3$
6	+1 $\frac{1}{2}(6) - 3$

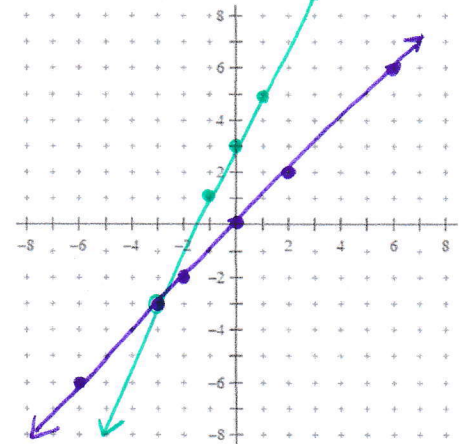
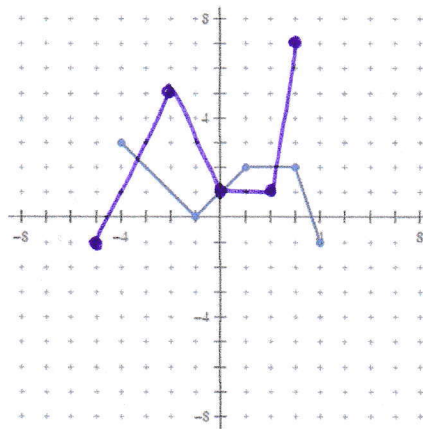
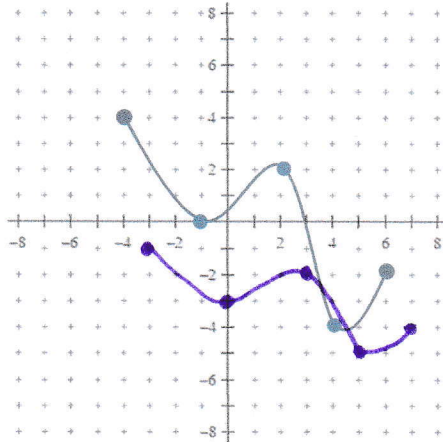
x	y
-3	-1
0	-3
3	-2
5	-5
7	-4

x	y
-4	-1 $-2(3) + 5$
-1	-1 $-2(0) + 5$
1	-1 $-2(2) + 5$
3	-1 $-2(2) + 5$
4	-1 $-2(1) + 5$

x	y
-5	-1
-2	5
0	1
2	1
3	7

x	y
-6	-2 $-6+3$
-2	-2 $-2+3$
0	0 $0+3$
2	2 $2+3$
6	6 $6+3$

x	y
-3	-3
-1	1
0	3
1	5
3	9



X-values

$$x-1 = \#$$

$$x = \# + 1$$

X-values

$$x+1 = \#$$

$$x = \# - 1$$

X-values

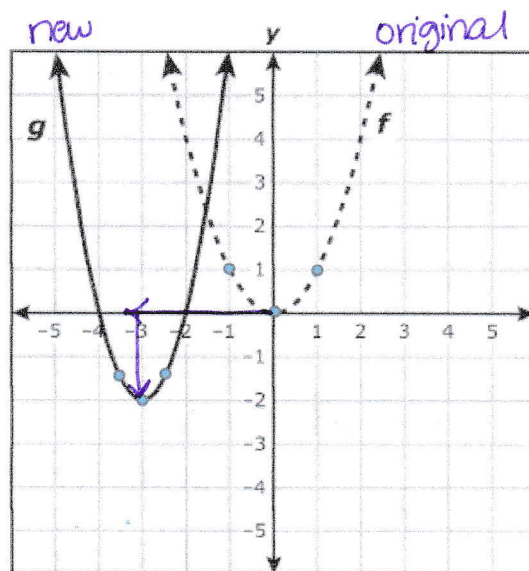
$$2x = \#$$

$$x = \frac{\#}{2}$$

Practice STAAR Question

The quadratic function $f(x) = x^2$ is transformed to create g as shown in the graph.

left 3
down 2
narrower



What is the equation for g ?

(A) $g(x) = f(x+3) - 2$

(B) $g(x) = 2f(x+3) - 2$

(C) $g(x) = f(x-3) + 2$ up 2

(D) $g(x) = 2f(x-3) + 2$ up 2