ALEGRBA RH

Essential Question: How do we identify and write equations of a transformed function?

Do Now:

If a quadratic function, $f(x)$, has a turning point at $(4, -5)$, and $g(x) = f(x-3) + 2$, then where does $g(x)$ have a turning point?

$+3 \quad +2$

$(7, -3)$

Today our focus is going to be on identifying and writing the equations of transformed functions.

I. Identify the needed information from the equation of the transformed function.

a. $g(x) = -x^2 - 1$

Name: quadratic

Transformations: reflection over the x-axis; vertical shift 1 unit down

b. $f(x) = 2|x+3|$

Name: absolute value

Transformations: vertical stretch by a factor of 2; horizontal shift 3 units left

c. $h(x) = \frac{1}{3}\sqrt{x-2} + 8$

Name: square root

Transformations: vertical compression by a factor of $\frac{1}{3}$; horizontal shift 2 units right; vertical shift 8 units up

d. $f(x) = (x-2)^3 + 1$

Name: cubic

Transformations: horizontal shift 2 units right; vertical shift 1 unit up

e. $g(x) = -5\sqrt[3]{x}$

Name: cube root

Transformations: reflection over x-axis; vertical stretch by a factor of 5

* Put in VERTEX form first*

f. $h(x) = x^2 - 6x + 4$

$\left(\frac{-6}{2}\right)^2$

$y - 4 = x^2 - 6x$
$+9 \qquad +9$
$y + 5 = (x-3)^2$
$y = (x-3)^2 - 5$

Name: quadratic

Transformations: horizontal shift 3 units right; vertical shift 5 units down

g. $f(x) = -5x^2 - 20x - 3$

$\left(\frac{4}{2}\right)^2$

$y + 3 = -5x^2 - 20x$
$y + 3 = -5(x^2 + 4x + 4)$
-20
$y - 17 = -5(x+2)^2$
$f(x) = -5(x+2)^2 + 17$

Name: quadratic

Transformations: reflection over the x-axis; vertical stretch by a factor of 5; horizontal shift 2 units left; vertical shift 17 units up

II. Write an equation of a function given the name and transformations

a. Quadratic: Vertically compressed by a factor of $\frac{2}{3}$, translated 5 units left and 6 units up

$$y = \frac{2}{3}(x+5)^2 + 6$$

b. Absolute Value: Vertical shift up 5, horizontal shift 6 units left

$$y = |x+6| + 5$$

c. Square Root: Translate 9 units right and reflected over the x-axis

$$y = -\sqrt{x-9}$$

d. Cubic: Vertically compressed by a factor of 0.45 and shifted 9 units down

$$y = 0.45x^3 - 9$$

e. Cube Root: Vertically stretched by a factor of 2, reflected over the x-axis and shifted 3 units left

$$y = -2\sqrt[3]{x+3}$$

f. Quadratic **(in standard form):** Vertically stretched by a factor of 4, reflected over the x-axis, translated 9 units up and 6 units left

$$y = -4(x+6)^2 + 9$$
$$y = -4(x^2 + 12x + 36) + 9$$
$$y = -4x^2 - 48x - 144 + 9$$
$$y = -4x^2 - 48x - 135$$

III. Write an equation of a new function given a ***NON PARENT*** function

a. Given $y = \sqrt{x-2} + 6$: Shift is 7 units down and reflect it over the x-axis

$-$ $\quad -7$

$$y = -\sqrt{x-2} - 1$$

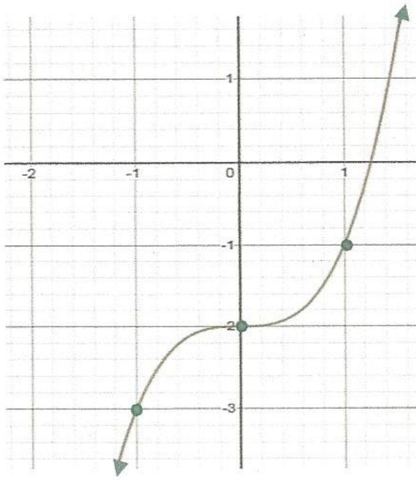
b. Given $y = -2|x+9|$: Shift it 3 units left, 2 units down and reflect it over the x-axis

$-$ $\quad +3 \quad -2$

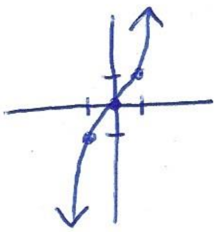
$$y = 2|x+12| - 2$$

IV. Write an equation given the graph of the transformed function (Don't forget the "a" value)

a.

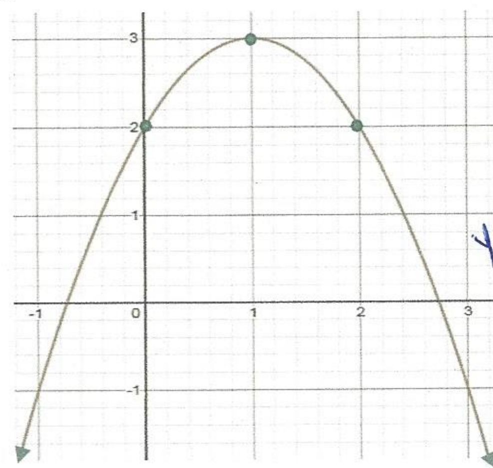


$y = x^3$

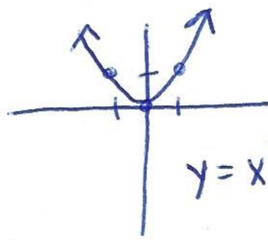


$y = x^3 - 2$

b.



$y = -1(x-1)^2 + 3$



$y = x^2$

$y = a(x-1)^2 + 3$

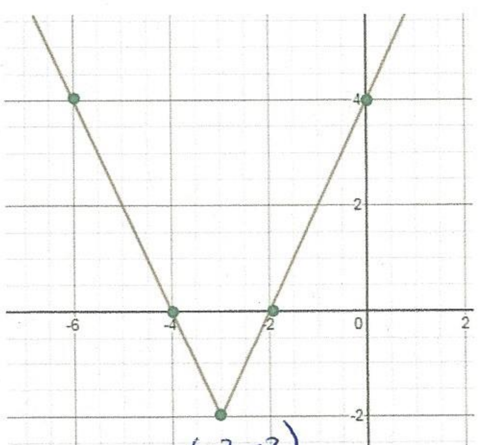
$(0,2)$

$2 = a(0-1)^2 + 3$

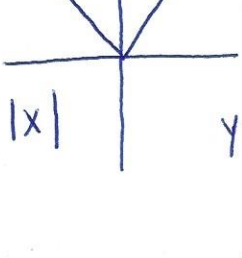
$2 = a + 3$

$a = -1$

c.



$(-3,-2)$



$y = |x|$

$y = a|x+3| - 2$

$(-6,4)$

$4 = a|-6+3| - 2$

$4 = a|-3| - 2$

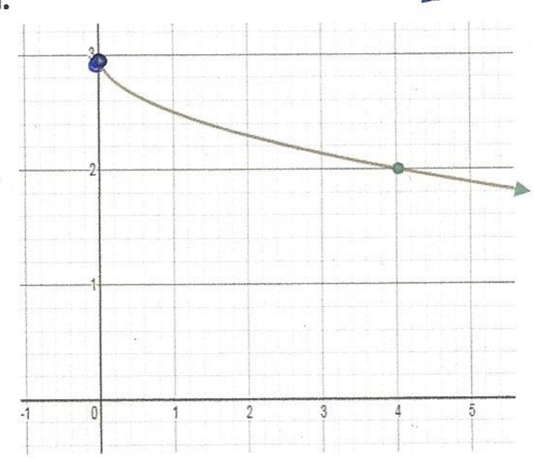
$4 = 3a - 2$

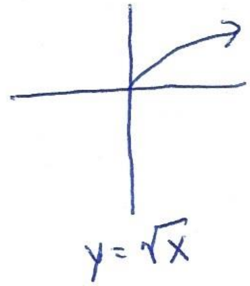
$6 = 3a$

$a = 2$

$y = 2|x+3| - 2$

d.





$y = \sqrt{x}$

starting point $(0,0)$

$y = a\sqrt{x} + 3$

$(4,2)$

$2 = a\sqrt{4} + 3$

$2 = 2a + 3$

$-1 = 2a$

$a = -\frac{1}{2}$

$y = -\frac{1}{2}\sqrt{x} + 3$