

Name: _____

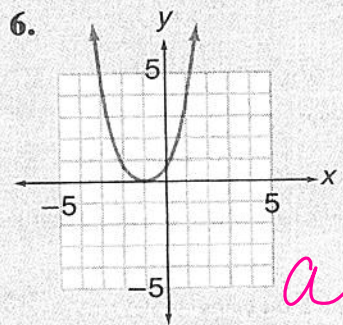
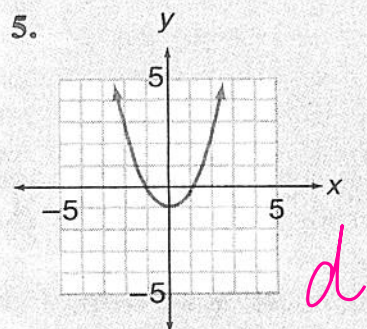
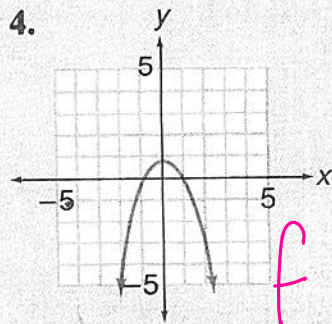
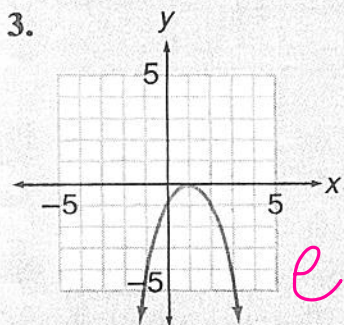
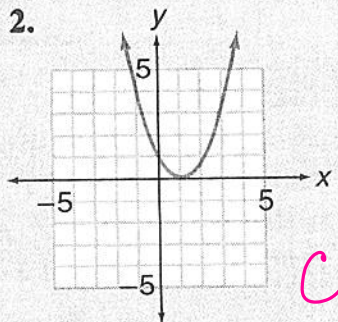
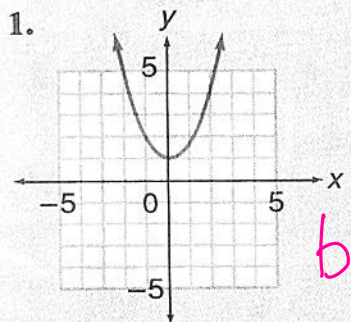
Date: _____

PC: Vertical and Horizontal Stretches and Shrinks

Ms. Loughran

Do Now:

Match each graph with one of the given quadratic equations.



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

(b) $y = x^2 + 1$

(c) $y = (x - 1)^2$

(d) $y = x^2 - 1$

(e) $y = -(x - 1)^2$

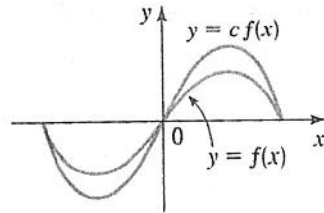
(f) $y = -x^2 + 1$

Vertical Stretching and Shrinking of Graphs

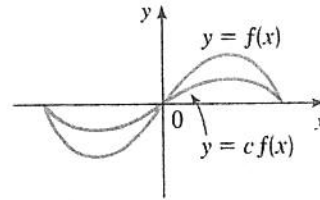
To graph $y = cf(x)$: multiply the y values by c

If $c > 1$, stretch the graph of $y = f(x)$ vertically by a factor of c .

If $0 < c < 1$, shrink the graph of $y = f(x)$ vertically by a factor of c .



$c > 1$



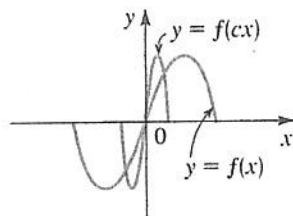
$0 < c < 1$

Horizontal Shrinking and Stretching of Graphs

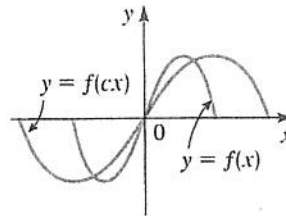
To graph $y = f(cx)$: multiply the x-values by $\frac{1}{c}$

If $c > 1$, shrink the graph of $y = f(x)$ horizontally by a factor of $1/c$.

If $0 < c < 1$, stretch the graph of $y = f(x)$ horizontally by a factor of $1/c$.



$c > 1$



$0 < c < 1$

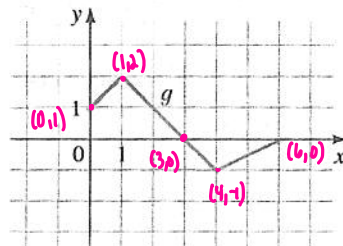
1. The graph of g is given. Use it to graph each of the following functions on a separate piece of graph paper.

(a) $y = g(2x)$

(b) $y = g\left(\frac{1}{2}x\right)$

(c) $y = 2g(x)$

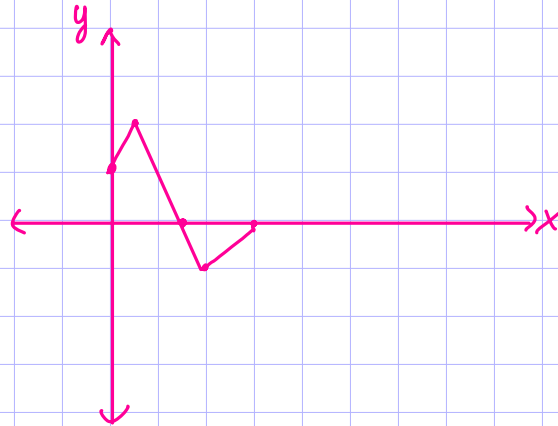
(d) $y = \frac{1}{2}g(x)$



(a) $y = g(2x)$

multiply the x values by $\frac{1}{2}$
horizontal shrink by a factor of $\frac{1}{2}$

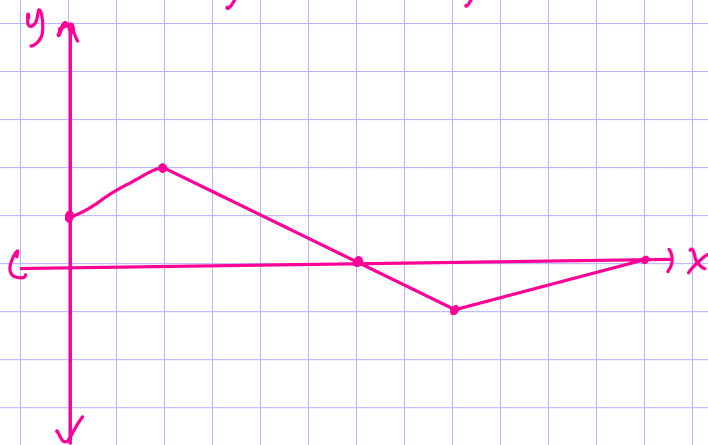
$(0,1)$	$(0,1)$
$(1,2)$	$(\frac{1}{2},2)$
$(3,0)$	$(\frac{3}{2},0)$
$(4,-1)$	$(2,-1)$
$(6,0)$	$(3,0)$



(b) $y = g(\frac{1}{2}x)$

horizontal stretch by a factor of 2
multiply x-values by 2

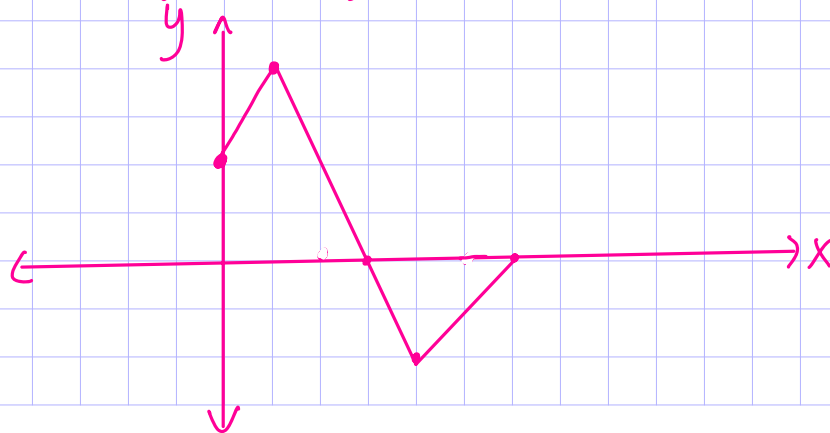
$(0,1)$	$(0,1)$
$(1,2)$	$(2,2)$
$(3,0)$	$(6,0)$
$(4,-1)$	$(8,-1)$
$(6,0)$	$(12,0)$

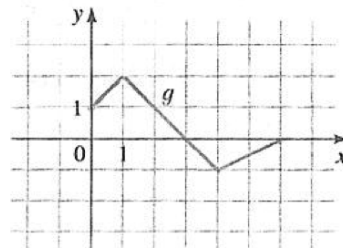


(c) $y = 2g(x)$

vertical stretch by a factor of 2
multiply y-values by 2

$(0,1)$	$(0,2)$
$(1,2)$	$(1,4)$
$(3,0)$	$(3,0)$
$(4,-1)$	$(4,-2)$
$(6,0)$	$(6,0)$





(d) $y = \frac{1}{2}g(x)$

vertical shrink by a factor of $\frac{1}{2}$
multiply y-values by $\frac{1}{2}$

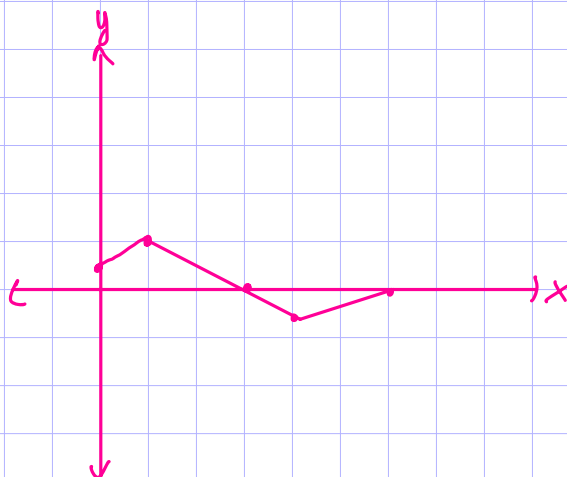
$(0, 1)$ $(0, \frac{1}{2})$

$(1, 2)$ $(1, 1)$

$(3, 0)$ $(3, 0)$

$(4, -1)$ $(4, -\frac{1}{2})$

$(6, 0)$ $(6, 0)$



2. $y = 3x^2 + 2$

x^2

vertical stretch by a factor of 3
mult. y's by 3

$(-1, 1)$

$(-1, 3)$

$(-1, 5)$

$(0, 0)$

$(0, 2)$

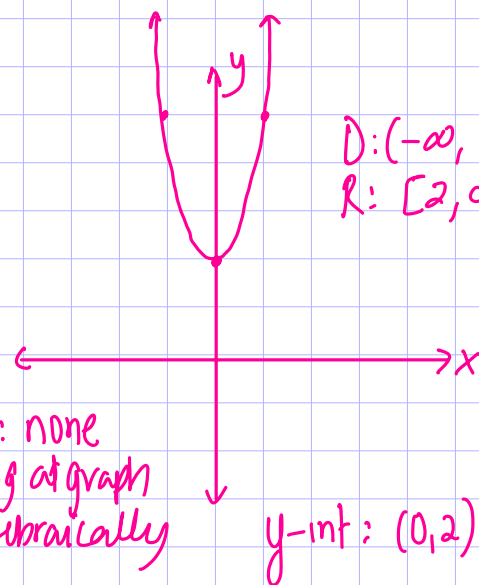
$(0, 2)$

$(1, 1)$

$(1, 3)$

$(1, 5)$

$(3x)^2$



$D: (-\infty, \infty)$
 $R: [2, \infty)$

x-int: none
by looking at graph
but algebraically

y-int: $(0, 2)$

$$0 = 3x^2 + 2$$

$$-2 = 3x^2$$

$$\pm \sqrt{\frac{-2}{3}} = \sqrt{x^2}$$

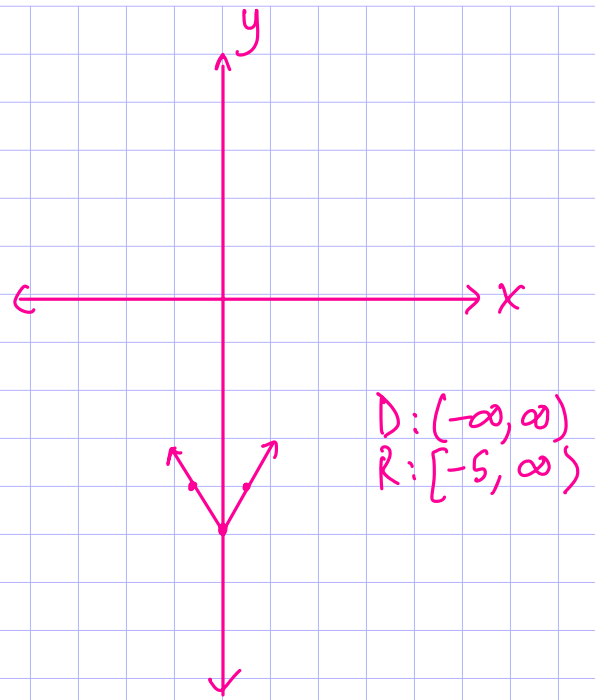
imaginary

horizontal stretch by a factor of $\frac{1}{2}$

4. $y = |2x| - 5$

↑
mult. x values by $\frac{1}{2}$ ↓ 5

$ x $		
(-1, 1)	$(-\frac{1}{2}, 1)$	$(-\frac{1}{2}, -4)$
(0, 0)	(0, 0)	(0, -5)
(1, 1)	$(\frac{1}{2}, 1)$	$(\frac{1}{2}, -4)$



x-int: (let $y=0$)

$$0 = |2x| - 5$$

$$5 = |2x|$$

$$5 = 2x$$

$$5 = -2x$$

$$\frac{5}{2} = x$$

$$-\frac{5}{2} = x$$

$$\left(\pm \frac{5}{2}, 0\right)$$

y-int: (0, -5)

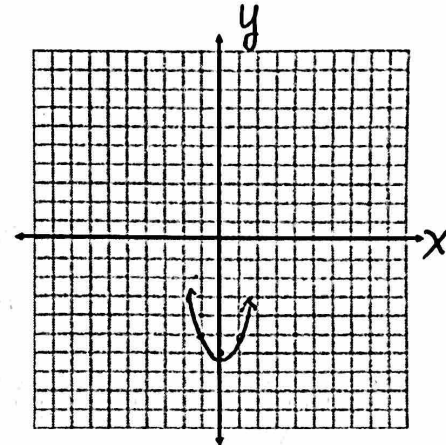
Homework 11-17

Name Key Period _____ Date _____

For problem 1- 6, please give the name of the parent function and describe the transformation represented. You may use your graphing calculator to compare & sketch.

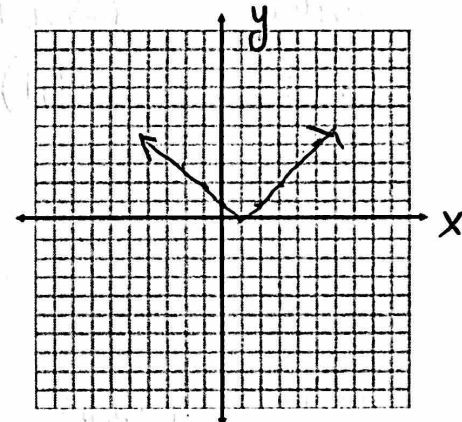
1. $g(x) = x^2 - 6$ Parent: x^2
 Transformations: $\downarrow 6$

$(-1, 1)$	$(-1, -5)$
$(0, 0)$	$(0, -6)$
$(1, 1)$	$(1, -5)$



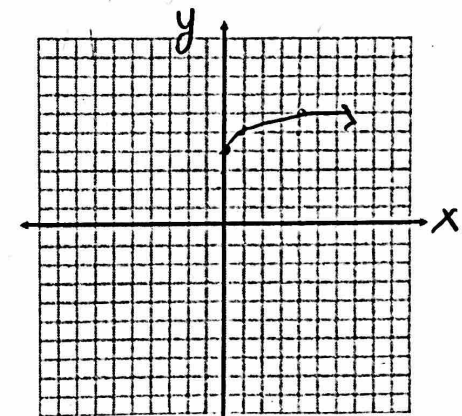
2. $f(x) = |x-1|$ Parent: $|x|$
 Transformations: right one

$(-1, 1)$	$(0, 1)$
$(0, 0)$	$(1, 0)$
$(1, 1)$	$(2, 1)$



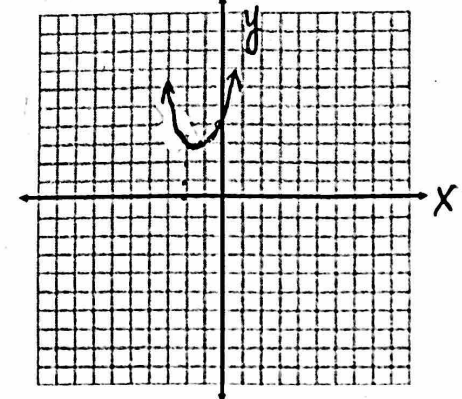
3. $h(x) = \sqrt{x} + 4$ Parent: \sqrt{x}
 Transformations: $\uparrow 4$

$(0, 0)$	$(0, 4)$
$(1, 1)$	$(1, 5)$
$(4, 2)$	$(4, 6)$



4. $g(x) = (x+1)^2 + 3$ Parent: x^2
 Transformations: left 1 \uparrow 3

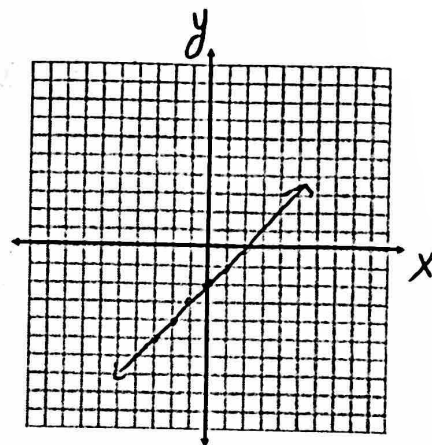
$(-1, 1)$	$(-2, 1)$	$(-2, 4)$
$(0, 0)$	$(-1, 0)$	$(-1, 3)$
$(1, 1)$	$(0, 1)$	$(0, 4)$



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

Parent: x

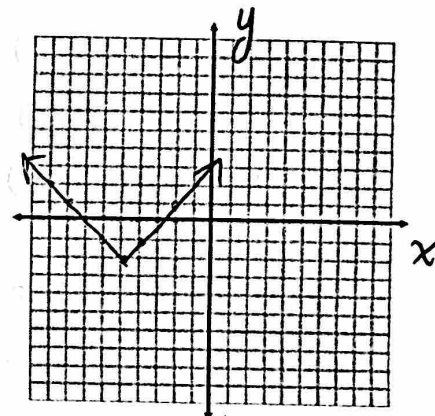
Transformations: $\downarrow 2$



6. $f(x) = |x + 5| - 2$

Parent: $|x|$

Transformations: left 5 \downarrow 2

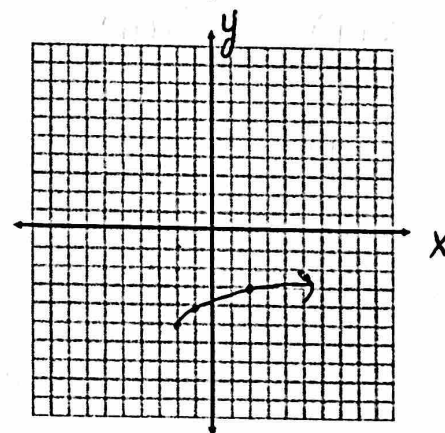


$(-1, 1)$	$(-6, 1)$	$(-6, -1)$
$(0, 0)$	$(-5, 0)$	$(-5, -2)$
$(1, 1)$	$(-4, 1)$	$(-4, -1)$

7. $h(x) = \sqrt{x+2} - 5$

Parent: \sqrt{x}

Transformations: left 2 \downarrow 5

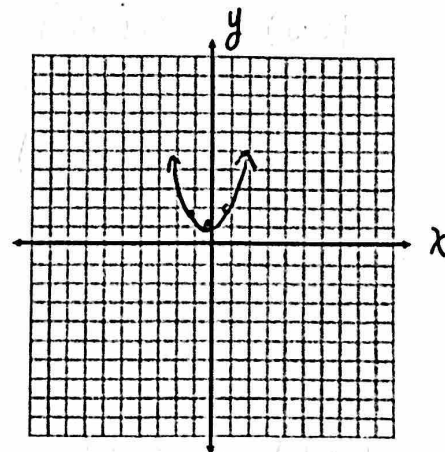


$(0, 0)$	$(-2, 0)$	$(-2, -5)$
$(1, 1)$	$(-1, 0)$	$(-1, -4)$
$(4, 2)$	$(2, 2)$	$(2, -3)$

8. $h(x) = x^2 + 1$

Parent: x^2

Transformations: $\uparrow 1$



$(-1, 1)$	$(-1, 2)$
$(0, 0)$	$(0, 1)$
$(1, 1)$	$(1, 2)$

9. $h(x) = x^3 - 2$

Parent: x^3

Transformations: $\downarrow 2$

$(-1, -1)$

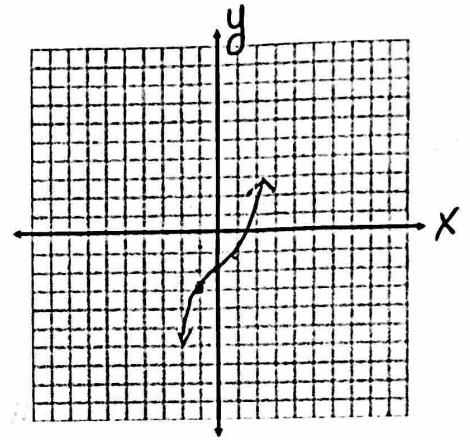
$(-1, -3)$

$(0, 0)$

$(0, -2)$

$(1, 1)$

$(1, -1)$



For problems 10 – 14, given the parent function and a description of the transformation, write the equation of the transformed function, $f(x)$.

10. Absolute value—vertical shift down 5, horizontal shift right 3. $f(x) = |x-3| - 5$

11. Linear—vertical shift up 5. $f(x) = x + 5$

12. Square Root—vertical shift down 2, horizontal shift left 7. $f(x) = \sqrt{x+7} - 2$

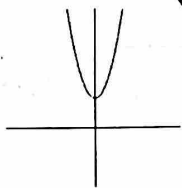
13. Quadratic—horizontal shift left 8. $f(x) = (x+8)^2$

14. Quadratic—vertex at $(-5, -2)$. $f(x) = (x+5)^2 - 2$
 (0,0) left 5 down 2

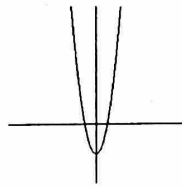
For problems 15 & 16, circle the graph that best represents the given function.

15. $f(x) = x^2 - 2$?

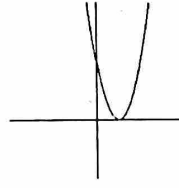
a.



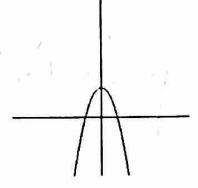
b.



c.

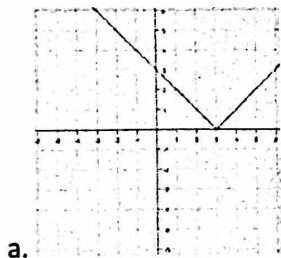


d.



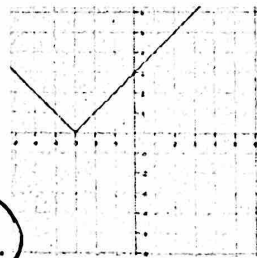
16. $g(x) = |x+3|$?

left 3

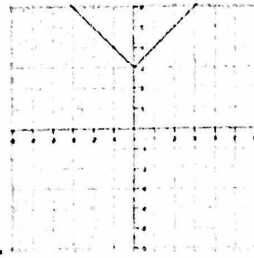


a.

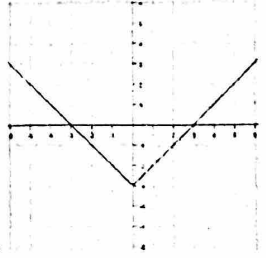
b.



c.

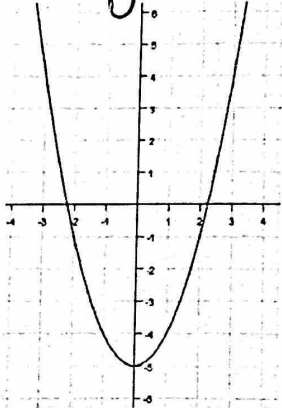


d.



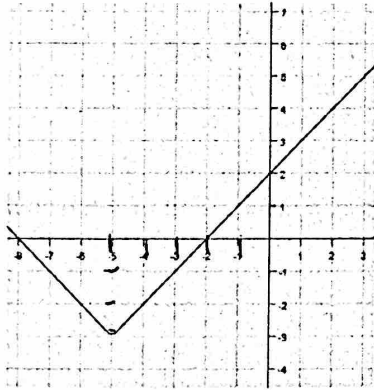
Write the equation for the following translations of their particular parent graphs. You may use $y=$ or function notation (the $f(x)$ type notation).

17. $y = x^2 - 5$

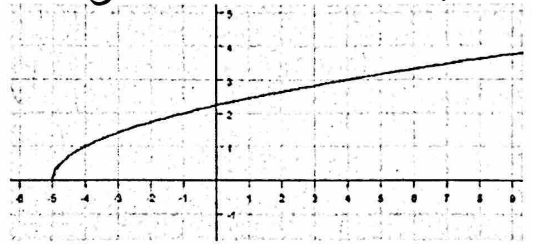


left 5
down 3

18. $y = |x+5| - 3$

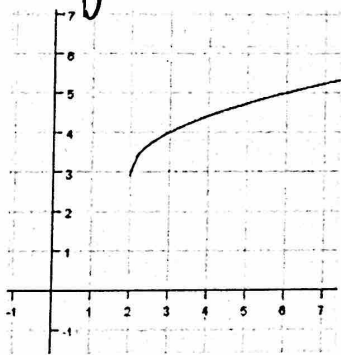


19. $y = \sqrt{x+5}$



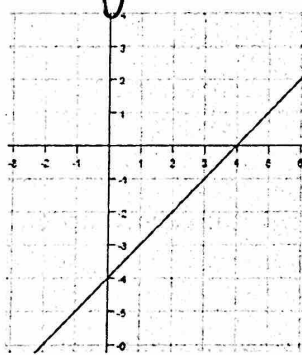
left 5

20. $y = \sqrt{x-2} + 3$

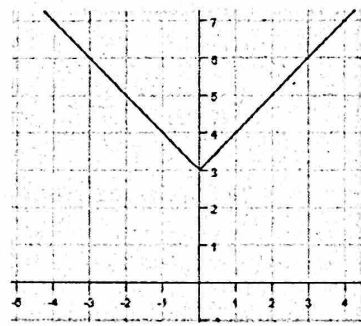


→ 2 ↑ 3

21. $y = x - 4$

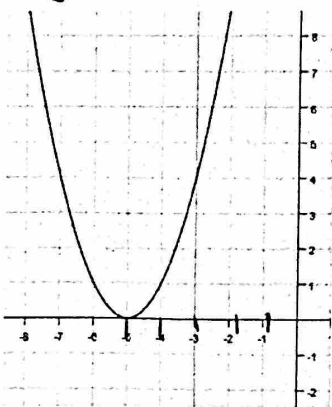


22. $y = |x| + 3$



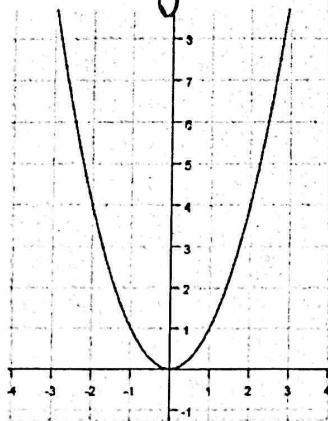
↑ 3

23. $y = (x+5)^2$

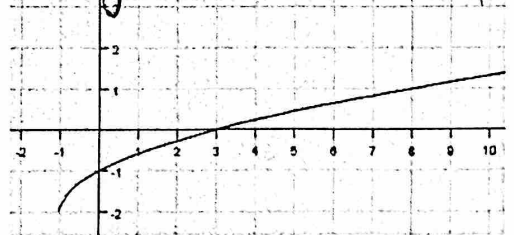


left 5

24. $y = x^2$



25. $y = \sqrt{x+1} - 2$



left 1
down 2