Precalculus
Section 1.7A Transformations

Name Key
Period_____ Date_____

Describe how the graph of $y = x^2$ can be transformed to the graph of the given equation.

1. $y = (x+50)^2 - 279$ left 50 down 279	2. $y = (100 - x)^2$ reflect y axis right 100
3. $y = -x^2 + 5.2$ reflect x-axis up 5.2	4. $y = -(3 - x)^2$ reflect x-axis reflect y-axis right 3

Describe how to transform the graph of f into the graph of g.

5. $f(x) = \sqrt{x+2}$ and $g(x) = \sqrt{x-4}$ (-2,0) (4,0) right 6	6. $f(x) = -\lvert x-3\rvert$ and $g(x) = \lvert x-3\rvert$ reflect x-axis
7. $f(x) = (x-2)^3$ and $g(x) = -(x+2)^3$ (2,0) (-2,0) reflect x-axis left 4	8. $f(x) = \frac{1}{x}$ and $g(x) = \frac{1}{x} + 5$ up 5

Find the equation of the reflection of f across (a) the x-axis and (b) the y-axis.

9. $f(x) = x^3 - 5x^2 - 3x + 2$ a) $-f(x) = -x^3 + 5x^2 + 3x - 2$ b) $f(-x) = -x^3 - 5x^2 + 3x + 2$	10. $f(x) = 2\sqrt{x+3} - 4$ a) $-f(x)$ b) $f(-x)$ $f(x) = -2\sqrt{x+3} + 4$ $f(x) = 2\sqrt{-x+3} - 4$
11. $f(x) = \sqrt[3]{7x}$ a) $-f(x)$ b) $f(-x)$ $f(x) = -\sqrt[3]{7x}$ $f(x) = \sqrt[3]{-7x} = -\sqrt[3]{7x}$	12. $f(x) = 3\lvert x+5\rvert$ a) $-f(x)$ b) $f(-x)$ $f(x) = -3\lvert x+5\rvert$ $f(x) = 3\lvert -x+5\rvert$

Sketch the graphs of the function when $c = -2, -1, 1,$ and 2 on the same set of coordinate axes.

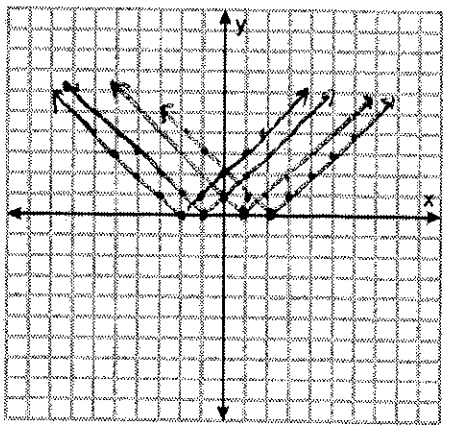
13. $f(x) = \lvert x - c\rvert$

$f(-2) = \lvert x+2\rvert$

$f(-1) = \lvert x+1\rvert$

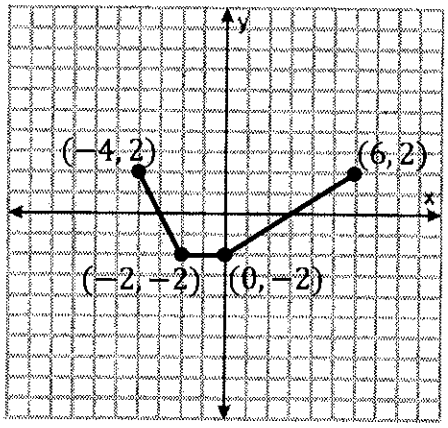
$f(1) = \lvert x-1\rvert$

$f(2) = \lvert x-2\rvert$



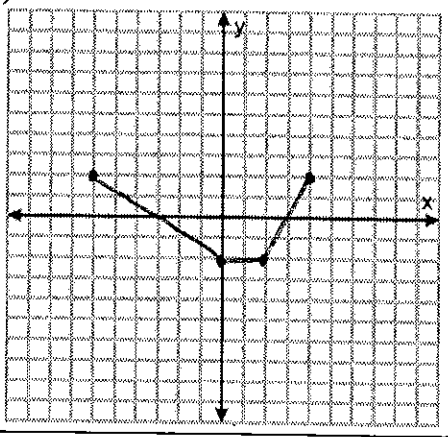
Use the graph of f to sketch each graph.

$f(x)$



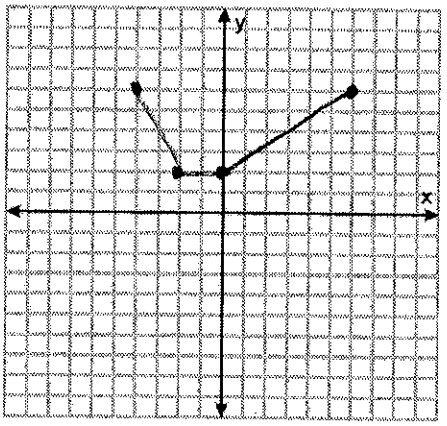
14. $y = f(-x)$

(4, 2)
(-6, 2)
(2, -2)
(0, -2)



15. $y = f(x) + 4$

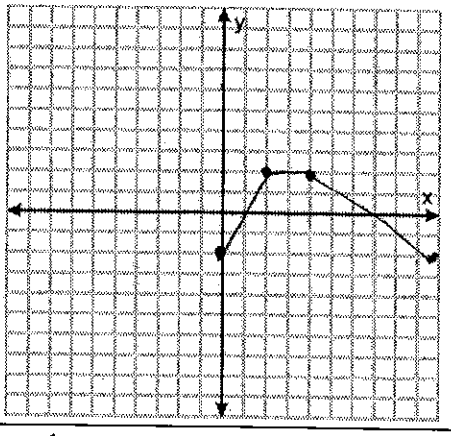
(-4, 6)
(-2, 2)
(0, 2)
(6, 6)



16. $y = -f(x - 4)$

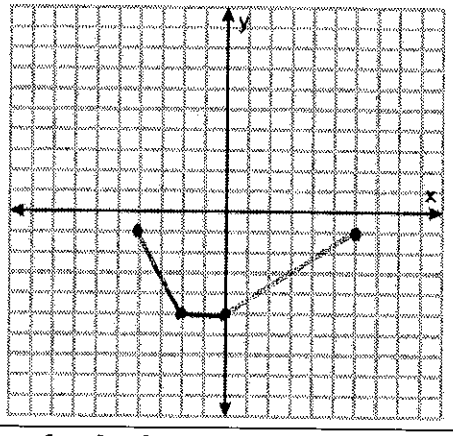
-f(x)
(-4, -2)
(-2, 2)
(0, 2)
(6, -2)

Right 4
(0, -2)
(2, 2)
(4, 2)
(10, -2)



17. $y = f(x) - 3$

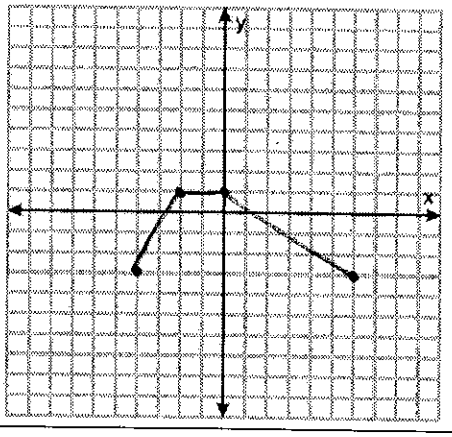
(-4, -1)
(-2, -5)
(0, -5)
(6, -1)



18. $y = -f(x) - 1$

-f(x)
(-4, -2)
(-2, 2)
(0, 2)
(6, -2)

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



Write an equation for the function whose graph is described.

19. The shape of $f(x) = x^2$, but shifted two units to the left, nine units up, and then reflected in the x-axis

$f(x) = -(x+2)^2 - 9$

20. The shape of $f(x) = x^3$, but shifted six units to the left, six units down, and then reflected in the y-axis

$y = (-x+6)^3 - 6$

21. The shape of $f(x) = |x|$, but shifted four units to the left and eight units down

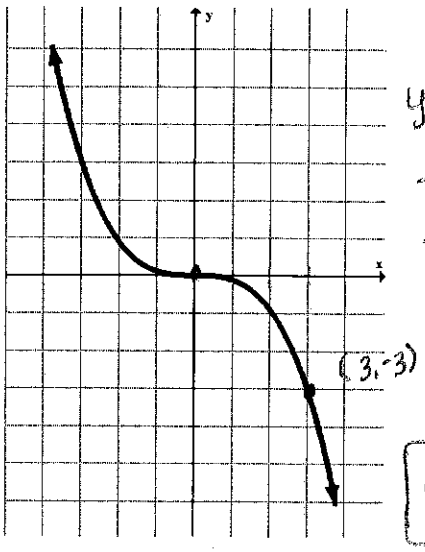
$f(x) = |x+4| - 8$

22. The shape of $f(x) = \sqrt{x}$, but shifted nine units down and then reflected in both the x-axis and y-axis

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

Write the equation for the function represented by each graph.

23.



$y = ax^3$

$-3 = a(3)^3$

$-3 = 27a$

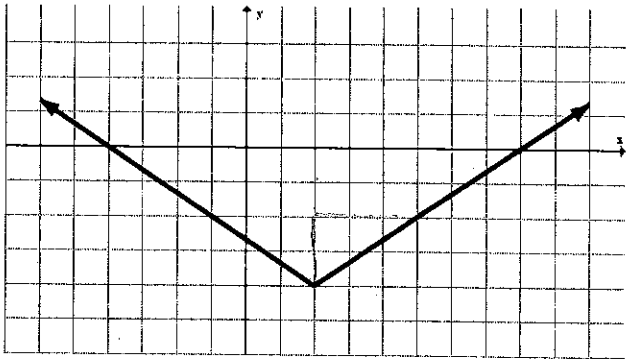
$a = \frac{-3}{27}$

$a = -1/9$

$\boxed{y = -1/9\,x^3}$

24.

$\boxed{y = \frac{2}{3}|x-2| - 4}$



25.

$y = a(x-h)^2 + k$

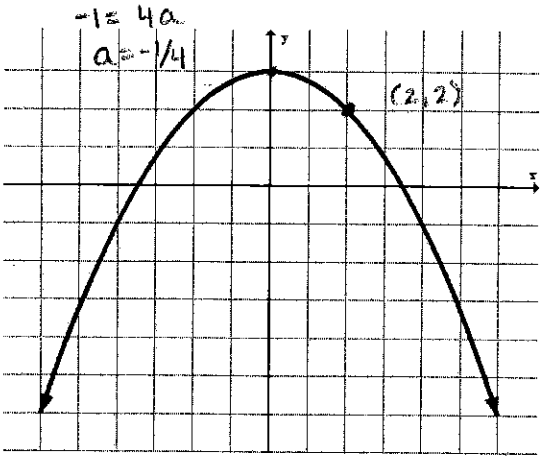
$y = a(x-0)^2 + 3$

$2 = a(2)^2 + 3$

$-1 = 4a$

$a = -1/4$

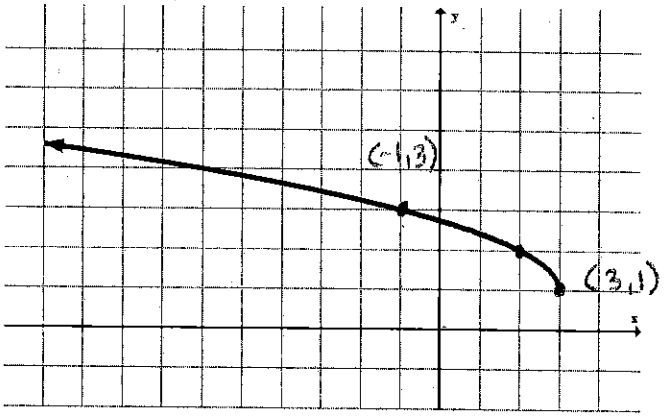
$\boxed{y = -\frac{1}{4}x^2 + 3}$



26.

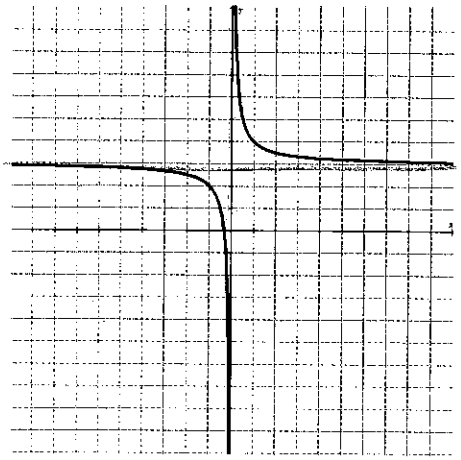
$y = a\sqrt{x-3} + 1$

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



27.

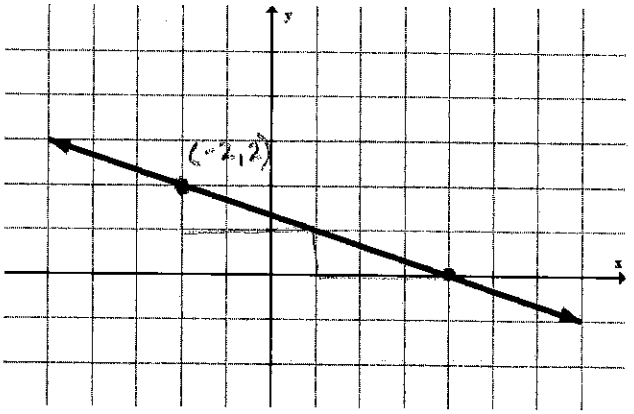
$y = \frac{1}{x} + 3$



28.

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

$y = -\frac{1}{3}x + 4/3$



29. Given: $f(x) = \sqrt[3]{x}$

Write the transformation in 2 different ways to create the new function $g(x)$ when $f(x)$ is:

a) shifted right 1

$g(x) = \sqrt[3]{x-1}$ $\quad g(x) = f(x-1)$

b) reflected in the y-axis and shifted up 5

$g(x) = \sqrt[3]{-x} + 5$ $\quad g(x) = f(-x) + 5$

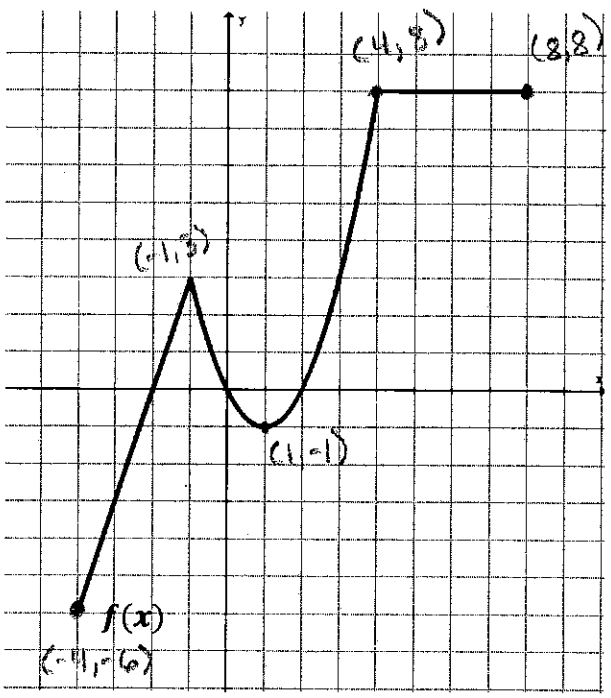
c) shifted down 9

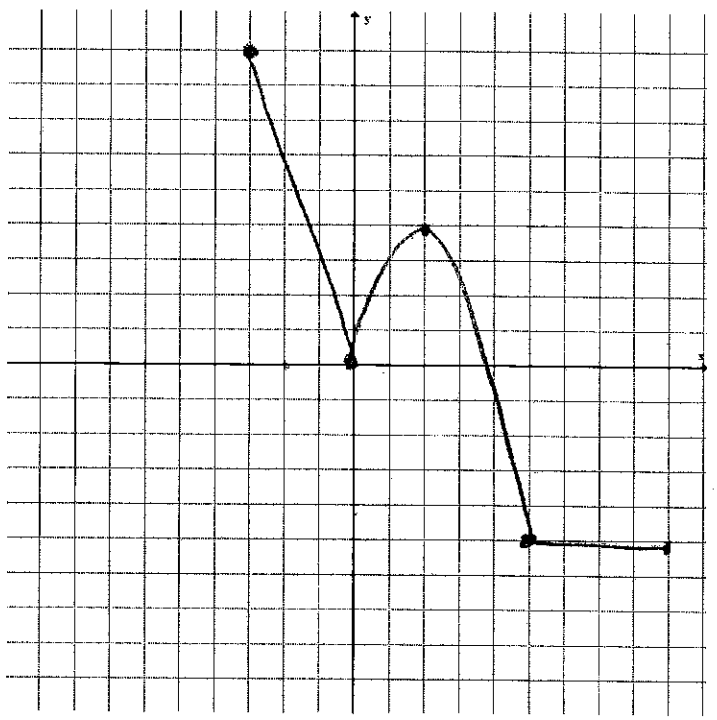
$g(x) = \sqrt[3]{x} - 9$ $\quad g(x) = f(x) - 9$

d) reflected in the x-axis and left 7

$g(x) = -\sqrt[3]{x+7}$ $\quad g(x) = -f(x+7)$

30. Graph: $h(x) = -f(x-1) + 3$





$-f(x)$	Right 1 up 3 $(+1, +3)$
$(-4, 6)$	$(-3, 9)$
$(-1, -3)$	$(0, 0)$
$(1, 1)$	$(2, 4)$
$(4, -8)$	$(5, -5)$
$(8, -8)$	$(9, -5)$