

Warm-Up

State whether the function is odd, even, or neither

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

2. $f(x) = \sqrt{x^2 + 2}$

Find the Domain

3) $f(x) = \sqrt{x - 2}$

4) $f(x) = \frac{7}{(3x-4)}$

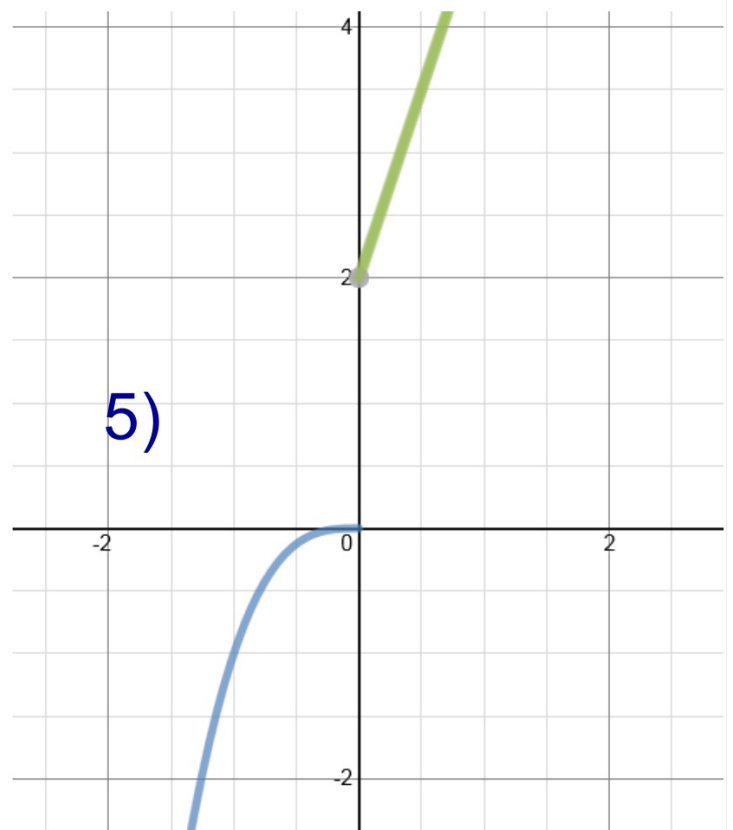
5) Graph the Piecewise function

$$f(x) = \begin{cases} x^3, & x < 0 \\ 3x+2, & x \geq 0 \end{cases}$$

- 1) odd
- 2) even
- 3) $[2, \infty)$
- 4) $(-\infty, 4/3) \cup (4/3, \infty)$

$$f(x) = \begin{cases} x^3, & x < 0 \\ 3x+2, & x \geq 0 \end{cases}$$

Domain, Range, continuity, $f(c)$



Homework Answers

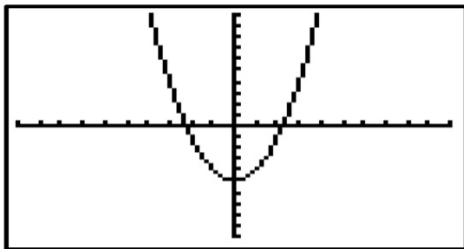
13. Exercise 8

14. Exercise 3

15. Exercises 7, 8

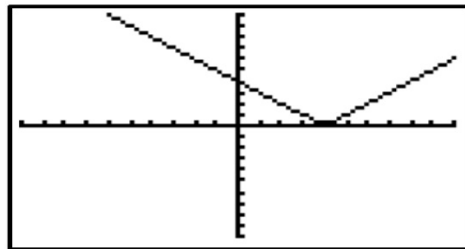
19. $y = x$, $y = x^3$, $y = 1/x$

29. Domain: All reals
Range: $[-5, \infty)$



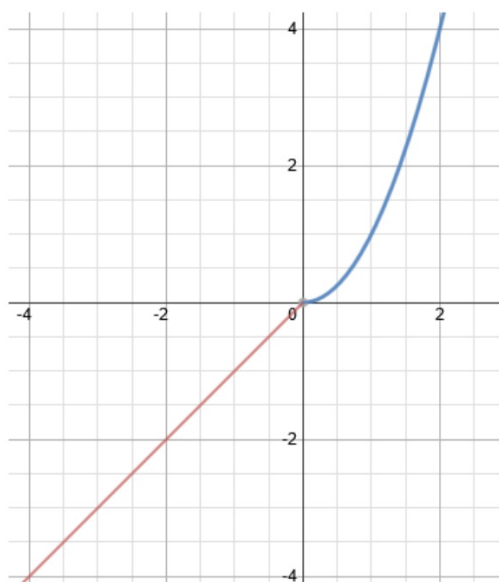
$[-10, 10]$ by $[-10, 10]$

30. Domain: All reals
Range: $[0, \infty)$

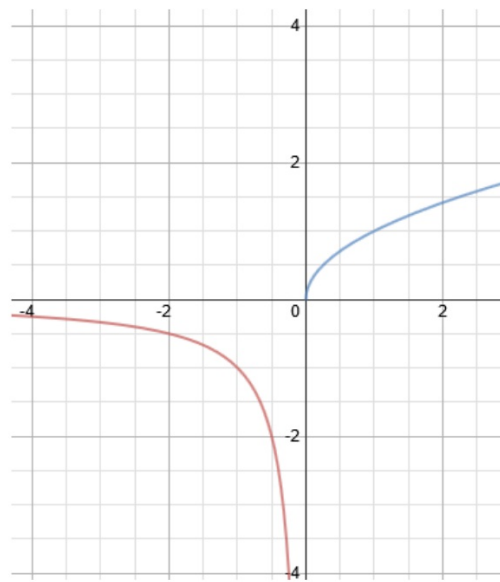


$[-10, 10]$ by $[-10, 10]$

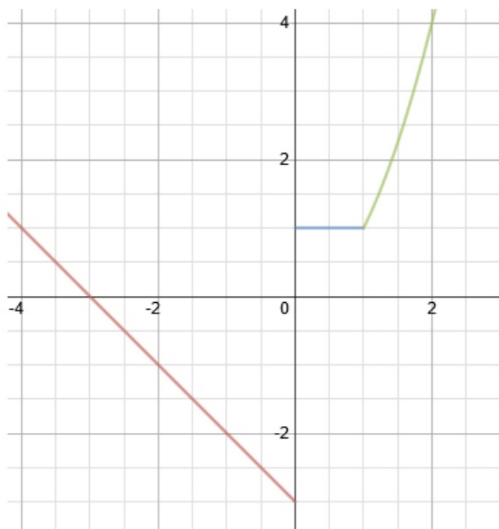
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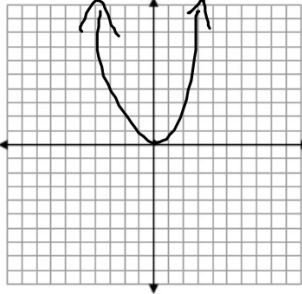
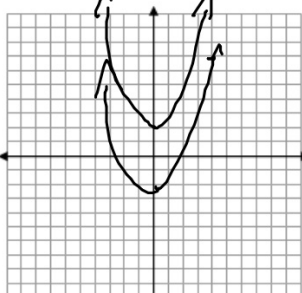
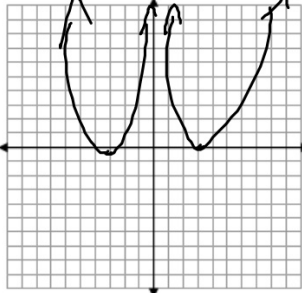


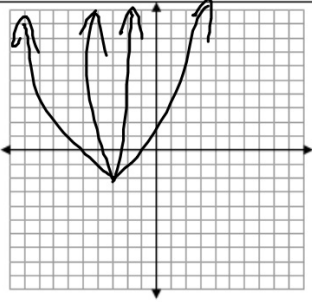
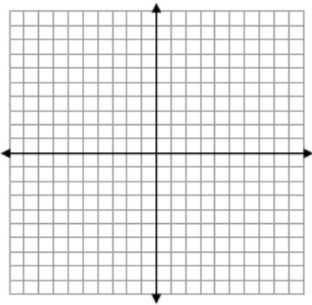
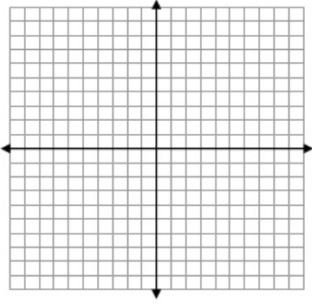
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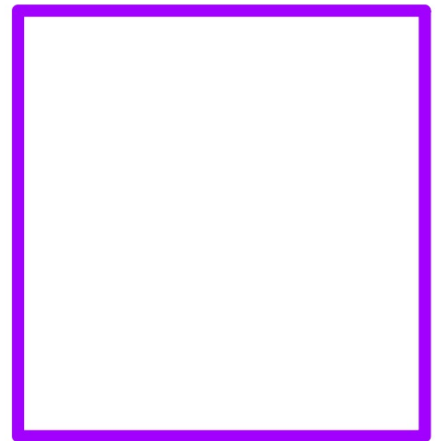
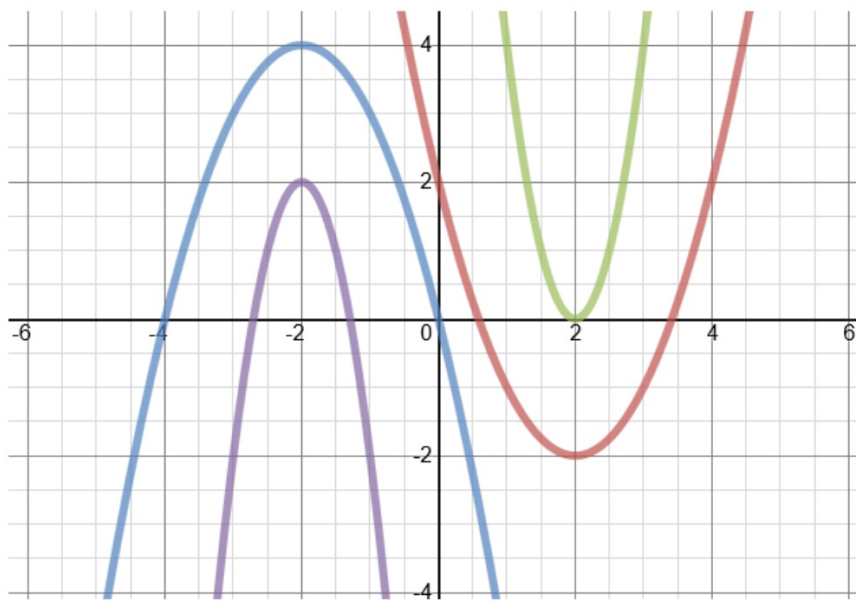


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Function(s)	Sketch the Graph(s)	Rule
$f(x) = x^2$		<p>No Rule!</p> <p>It's the original. For the others, state whether it is moving up, down, left, right, etc. from the original</p>
$f(x) = x^2 + 2$ $f(x) = x^2 - 2$		<p>VERTICAL SHIFT UP or down</p>
$f(x) = (x - 3)^2$ $f(x) = (x + 3)^2$		<p>HORIZONTAL SHIFT 3</p>

$f(x) = 2(x + 3)^2 - 2$ $f(x) = \frac{1}{2}(x + 3)^2 - 2$		<p>VERTICAL STRETCH OR SHRINK</p>
$f(x) = -(x + 2)^2$ $f(x) = (-x + 2)^2$		<p>$-f(x)$ REFLECT X-AXIS</p> <p>$f(-x)$ REFLECT Y-AXIS</p>
$f(x) = (3x)^2$ $f(x) = (1/3x)^2$		<p>HORIZONTAL SHRINK OR STRETCH</p>



- 1 $(x-2)^2-2$
- 2 $-(x+2)^2+4$
- 3 $(2x-4)^2$
- 4 $-(-2x-4)^2+2$

Translations and transformations of graphs

- $f(x) + a$ is $f(x)$ shifted upward a units
- $f(x) - a$ is $f(x)$ shifted downward a units
- $f(x + a)$ is $f(x)$ shifted left a units
- $f(x - a)$ is $f(x)$ shifted right a units
- $-f(x)$ is $f(x)$ flipped upside down ("reflected about the x -axis")
- $f(-x)$ is the mirror of $f(x)$ ("reflected about the y -axis")

Order of steps for translations:

$$f(x) = a f(b(x - c)) + d$$

$$-4 f(2(x+3))^2 + 4$$



1. X reflection (reflection over the y axis)
2. Divide x by b (horizontal stretch or shrink)
3. Shift c units (horizontal shift)
4. Y reflection (reflection over the x axis)
5. multiply y by a (vertical stretch or shrink)
6. shift d units (vertical shifts)

Describe how each function translated from its parent function:

1. $f(x) = -(x+5)^2 - 1$

2. $f(x) = 3(x-2)^3 + 4$

Write an equation for the following translation:

$y = x^2$

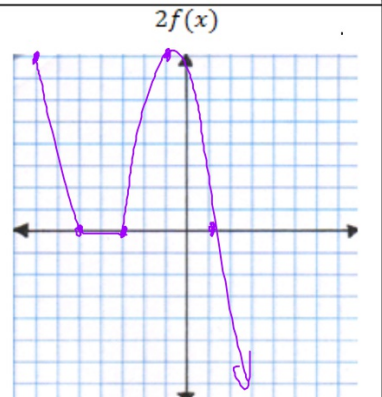
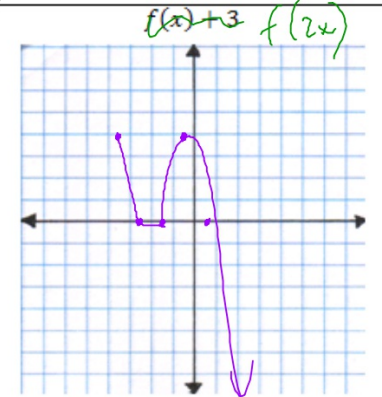
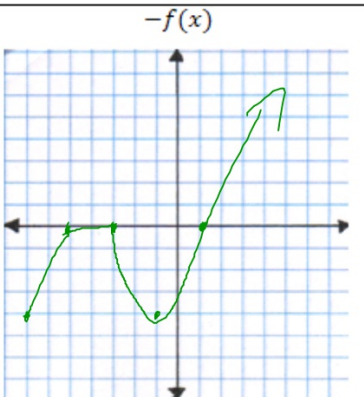
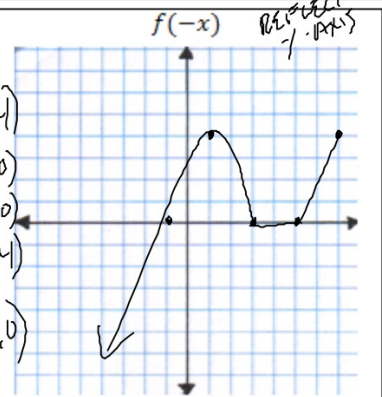
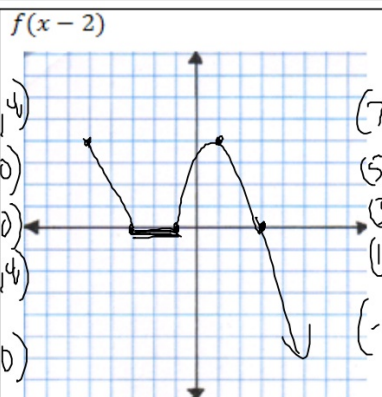
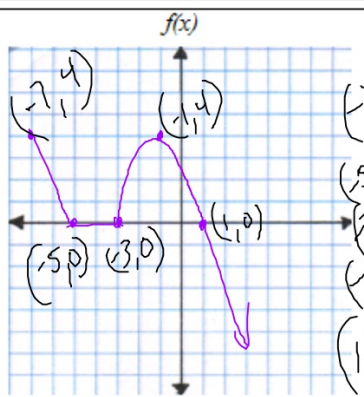
3. $g(x) = \sqrt[5]{3-x} + 3$: a vertical stretch by a factor of 3, then a shift right 4 units.

4. $g(x) = -\frac{1}{2}|x+5| - 1$

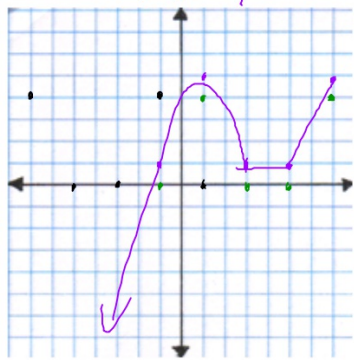
6. $y = |x|$: a shift left 2 units, then a vertical stretch by a factor of 2 and finally a shift down 4 units.

$y = 2|x+2| - 4$

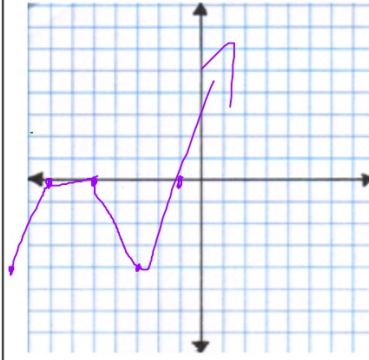
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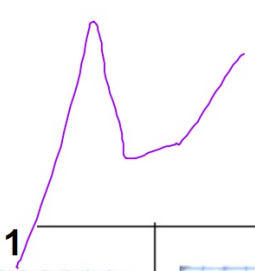
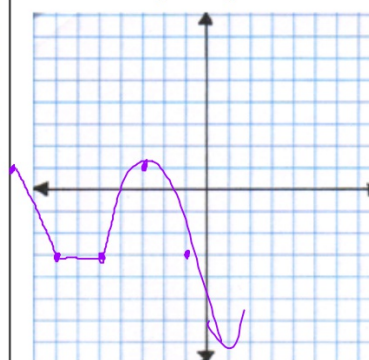
$$f(-x) + 1$$



$$-f(x+2)$$



$$f(x+2) - 3$$



****Challenge Questions****

I. Describe the translations of
 $f(x) = -3|x - 4| + 3$

II. Describe the translations of
 $f(x) = 2(6 - 3x)^2 + 2$

III. If $f(x) = x^3$ and $g(x) = 2f(x - 2) + 3$
write an equation for $g(x)$

Wrap up Day 3

Describe the transformation for each:

1. $g(x) = 2(x - 3)^2 - 4$

2. $f(x) = -3\sqrt{x+1}$

Write an equation for the following transformations:

3. $y = x^2$: a shift left 3 units, then a vertical stretch by a factor of 2.

4. $y = |x|$: a shift down 2 units, then reflected over the x-axis, and finally a shift left 4 units.