

Pre-Calculus 12 Reflections

A reflection of a graph creates a mirror image in a line called the line of reflection. A reflection does not change the shape of the graph, but it may change the orientation.

For a function $y = f(x)$:

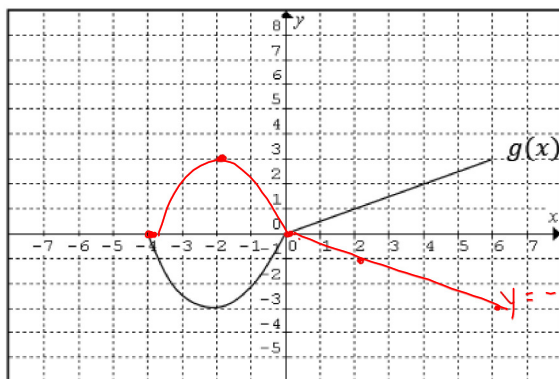
$y = -f(x)$ is the graph of $y = f(x)$ after a reflection in the x -axis

Note: Point (x, y) becomes the image point $(x, -y)$

$y = f(-x)$ is the graph of $y = f(x)$ after a reflection in the y -axis

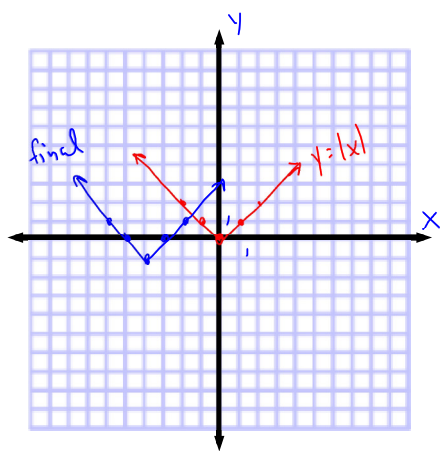
Note: Point (x, y) becomes the image point $(-x, y)$

Ex. 1): Given the graph of $g(x)$ sketch $y = -g(x)$. State the domain and range of each function.



reflection over the x -axis
 * mult y -coords by (-1)
 $g(x)$ $y = -g(x)$
 $D: [-4, 6]$ $[-4, 6]$
 $R: [-3, 3]$ $[-3, 3]$

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$$y = |x|$$

x	y
-2	2
-1	1
0	0
1	1
2	2

$$y = |x+4| - 1$$

↑ left 4 ↑ down 1

$$7) (-3, 8) \rightarrow y = f(x-6) - 1$$

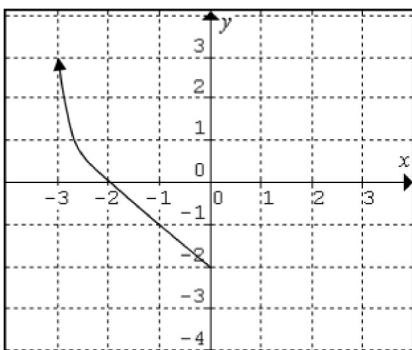
↑ right 6 ↓ down 1

$$y = f(x)$$

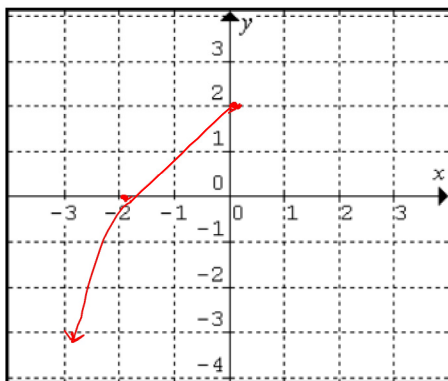
$$(-9, 9)$$

backwards
left 6 up 1

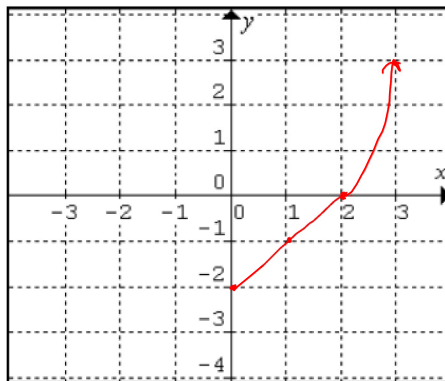
Ex. 2): Given $f(x)$



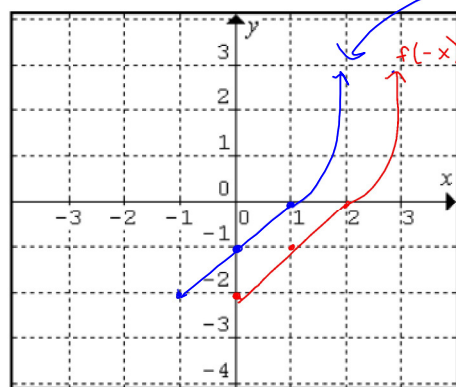
a) Sketch $g(x) = -f(x)$ *over x-axis*



b) Sketch $g(x) = f(-x)$ *over y-axis (mult x-coords by -1)*



c) Sketch $g(x) = f(-x - 1)$



$g(x) = f(-(x+1))$
** must be factored out*
left one unit

$$f(b(x-h))$$

$$f(-(x+1))$$

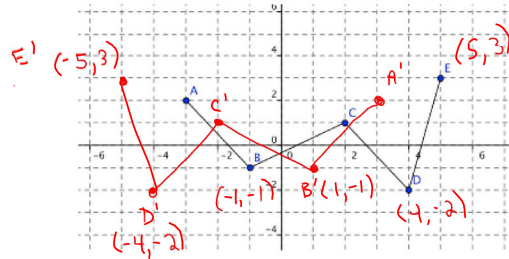
$$\begin{array}{c} \downarrow \\ \uparrow b \\ f(2(x+1)) \end{array}$$

$$f(2x+2)$$

$$f(2(x+1))$$

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Ex. 3) Given the graph of $y = f(x)$, sketch $y = f(-x)$. State the domain and range of each function.



ie $A(-3, 2) \rightarrow A'(-5, 3)$

$f(x)$	$f(-x)$
D: $[-3, 5]$	$[-5, 3]$
R: $[-2, 3]$	$[-2, 3]$

Ex. 4) Write an equation for the image of each function below after:

- i) a reflection of its graph in the x-axis $-f(x)$ or $y = -()$
- ii) a reflection of its graph in the y-axis $f(-x)$ replace x with $-x$

a) $g(x) = \sqrt{x-3}$

i) $y = -\sqrt{x-3}$
or $y = -g(x)$

ii) $y = \sqrt{-x-3}$
or $y = g(-x)$

b) $f(x) = \frac{1}{x+1}$

i) $y = \frac{-1}{x+1}$
or $y = -f(x)$

ii) $y = \frac{1}{-x+1}$
or $y = f(-x)$

Ex. 5) The graph of $f(x)$ has x-intercepts -3, -1, 1 and a y-intercept of -3. Determine the new intercepts after a reflection in the y-axis.

x-int $3, 1, -1$

y-int -3 ← no change
x=0 and y-coords not affected

Ex. 6) The domain of a function is $[-1, 4]$. What is the domain of the function after a reflection in the x-axis?

$[-1, 4]$

Assign # 1a, 2
3a, 5 b, c
6, 7
10 b