

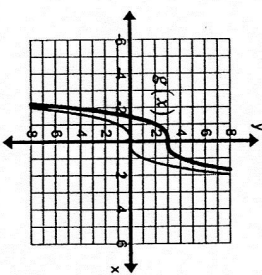
# Transformations Notes

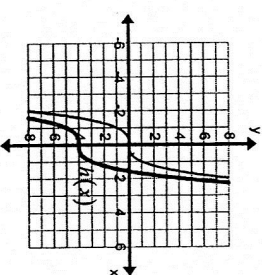
## Example 1: Vertical Shift

Given  $f(x) = x^3$ , graph each new function, without technology, and describe the effect of  $k$  on the original graph. Determine if the transformed function is even, odd, or neither.

a.  $g(x) = f(x) + 3$

b.  $h(x) = f(x) - 2$

<p>a. <math>g(x) = f(x) + 3 = x^3 + 3</math></p> 	<p><math>k = 3</math> so the graph is shifted up 3 units. The transformed function is neither odd nor even.</p>
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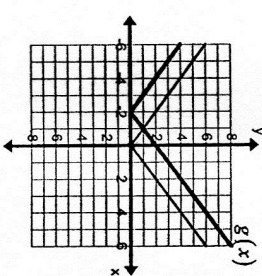
<p>b. <math>h(x) = f(x) - 4 = x^3 - 4</math></p> 	<p><math>k = -4</math> so the graph is shifted down 4 units. The transformed function is neither odd nor even.</p>
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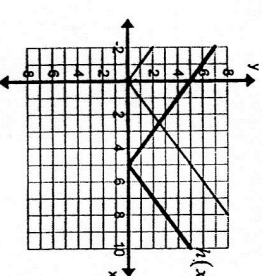
## Example 2: Horizontal Shift

Given  $f(x) = |x|$ , graph each new function, without technology, and describe the effect of  $k$  on the original graph. Determine if the transformed function is even, odd, or neither.

a.  $g(x) = f(x + 2)$

b.  $h(x) = f(x - 5)$

<p>a. <math>g(x) = f(x + 2) =  x + 2 </math></p> 	<p><math>k = 2</math> so the graph is shifted left 2 units. The transformed function is neither odd nor even.</p>
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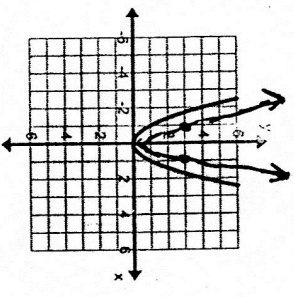
<p>b. <math>h(x) = f(x - 5) =  x - 5 </math></p> 	<p><math>k = -5</math> so the graph is shifted right 5 units. The transformed function is neither odd nor even.</p>
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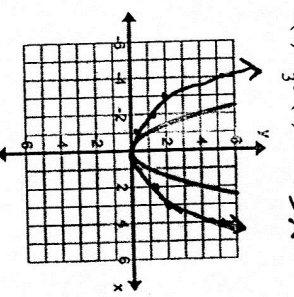
**Example 3: Vertical Stretch**

Given  $f(x) = x^2$ , graph each new function, without technology, and describe the effect of  $k$  on the original graph. Determine if the transformed function is even, odd, or neither.

a.  $g(x) = 3f(x)$

b.  $h(x) = \frac{1}{3}f(x)$

<p>a. <math>g(x) = 3f(x) = 3x^2</math></p> 	<p><math>k = 3</math> so the graph is stretched vertically by a factor of 3.</p> <p>Even Function</p>
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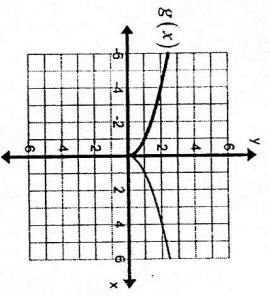
<p>b. <math>h(x) = \frac{1}{3}f(x) = \frac{1}{3}x^2</math></p> 	<p><math>k = \frac{1}{3}</math> so the graph is stretched vertically by a factor of <math>\frac{1}{3}</math>.</p> <p>Even Function</p>
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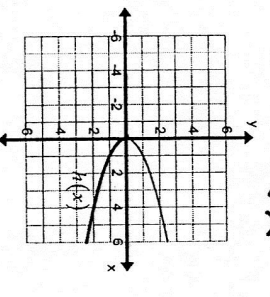
**Example 4: Reflections**

Given  $f(x) = \sqrt{x}$ , graph each new function, without technology, and describe the effect of  $k$  on the original graph. Determine if the transformed function is even, odd, or neither.

a.  $g(x) = f(-x)$

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

<p>a. <math>g(x) = f(-x) = \sqrt{-x}</math></p> 	<p><math>k = -1</math> so the graph is reflected across the y-axis.</p> <p>The transformed function is neither odd nor even.</p>
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<p>b. <math>h(x) = -f(x) = -\sqrt{x}</math></p> 	<p><math>k = -1</math> so the graph is reflected across the x-axis.</p> <p>The transformed function is neither odd nor even.</p>
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Parent Graphs

$G(x) = f(x) - 2$

$G(x) = f(x+3)$

$G(x) = -f(x)$

$G(x) = f(-x)$

$G(x) = -f(x+1) + 2$

$F(x) = x$	$G(x) = x - 2$	$G(x) = (x+3)$	$G(x) = -(x)$	$G(x) = (-x)$	$G(x) = -(x+1)+2$
$F(x) = x^2$	$G(x) = x^2 - 2$	$G(x) = (x+3)^2$	$G(x) = -(x)^2$	$G(x) = (-x)^2$	$G(x) = -(x+1)^2+2$
$F(x) = x^3$	$G(x) =$	$G(x) =$	$G(x) =$	$G(x) =$	$G(x) =$
$F(x) = \sqrt{x}$	$G(x) =$	$G(x) =$	$G(x) =$	$G(x) =$	$G(x) =$
$F(x) =  x $	$G(x) =$	$G(x) =$	$G(x) =$	$G(x) =$	$G(x) =$

*Vertical Stretches*

$G(x) = 3x$

$G(x) = \sqrt[4]{4x^2}$

$G(x) = -2x^3$

$G(x) = \frac{1}{2}\sqrt{x}$

$G(x) = 5|x|$