

Your Name

Mrs. Theo

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Notes

Lesson 1.1

DILATIONS

Let's Play with Function Transformations and figure out what **a** and **b** do!

<https://www.geogebra.org/m/uTddJKRC#material/HJvZSUna>

$$f(x) = a \cdot f(bx - h) + k$$

<p>Vertical Stretch/Shrink Dilations</p> <p>$f(x) = a f(b(x - h)) + k$</p>	<p>Given any function, describe the effects parameter a has on its graph when</p> <p>a. $a > 1$ ($a > 1$ or $a < -1$) Vertical stretch by a factor of a</p> <p>b. $0 < a < 1$ ($0 < a < 1$ or $-1 < a < 0$) Vertical shrink by a factor of a</p> <p>c. $a < 0$ (a is negative) Vertical Reflection over x-axis</p> <p>d. $a = 0$ function no longer looks like its family</p>
<p>Horizontal Stretch/Shrink Dilations</p> <p>$f(x) = a f(b(x - h)) + k$</p>	<p>Given any function, describe the effects parameter b has on its graph when</p> <p>a. $b > 1$ ($b > 1$ or $b < -1$) Horizontal shrink/compression by $\frac{1}{b}$</p> <p>b. $0 < b < 1$ ($0 < b < 1$ or $-1 < b < 0$) Horizontal stretch by $\frac{1}{b}$</p> <p>c. $b < 0$ (b is negative) Horizontal Reflection over y-axis</p> <p>d. $b = 0$ function no longer looks like its family</p>

<p>Graph and Describe the Transformation</p>	<p>$y = 2x^3$ $y = a(x-h)^3 + k$ $y = 2(x-0)^3 + 0$</p> <p>Parent Function Cubic</p> <p>Parent Equation $y = x^3$</p> <p>New Vertex/Center: $(h, k) \rightarrow (0, 0)$</p> <p>Describe $a = 2$ Vertical stretch by 2</p> <p>Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$</p>	<table border="1" style="margin-top: 10px;"> <thead> <tr> <th>x</th> <th>$y = 2x^3$</th> </tr> </thead> <tbody> <tr> <td>-2</td> <td>$2(-2)^3 = -16$</td> </tr> <tr> <td>-1</td> <td>$2(-1)^3 = -2$</td> </tr> <tr> <td>0</td> <td>$2(0)^3 = 0$</td> </tr> <tr> <td>1</td> <td>$2(1)^3 = 2$</td> </tr> <tr> <td>2</td> <td>$2(2)^3 = 16$</td> </tr> </tbody> </table>	x	$y = 2x^3$	-2	$2(-2)^3 = -16$	-1	$2(-1)^3 = -2$	0	$2(0)^3 = 0$	1	$2(1)^3 = 2$	2	$2(2)^3 = 16$
x	$y = 2x^3$													
-2	$2(-2)^3 = -16$													
-1	$2(-1)^3 = -2$													
0	$2(0)^3 = 0$													
1	$2(1)^3 = 2$													
2	$2(2)^3 = 16$													

Graph and Describe the Transformation

$$y = 0.25|x|$$

$$y = \frac{1}{4}|x-0|+0$$

h
 K

Parent Function
Absolute Value

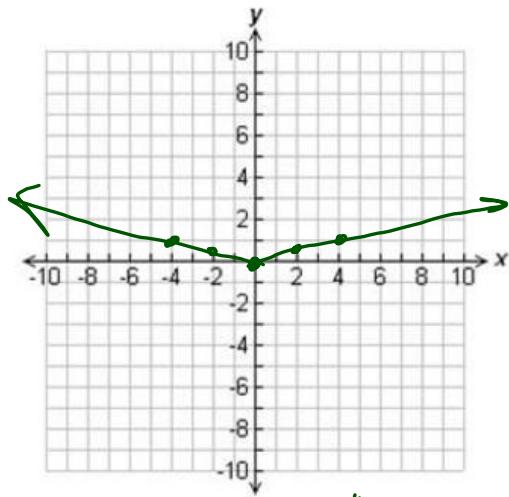
Parent Equation
 $y = |x|$

New Vertex/Center:
 $(h, k) \rightarrow (0, 0)$

Describe
 $a = \frac{1}{4}$ Vertical shrink by $\frac{1}{4}$

Domain: $(-\infty, \infty)$

Range: $[0, \infty)$



x	$y = \frac{1}{4} x $
-4	$\frac{1}{4} -4 = 1$
-2	$\frac{1}{4} -2 = \frac{1}{2}$
0	$\frac{1}{4} 0 = 0$
2	$\frac{1}{4} 2 = \frac{1}{2}$
4	$\frac{1}{4} 4 = 1$

Graph and Describe the Transformation

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

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

h
 K

Parent Function
Quadratic

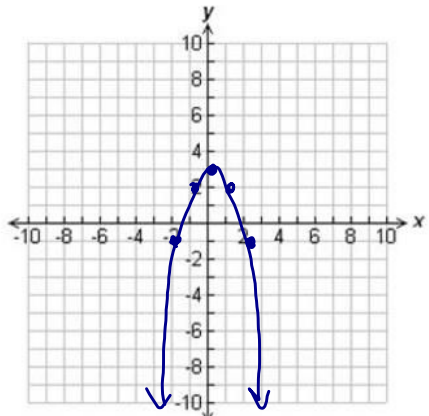
Parent Equation
 $y = x^2$

New Vertex/Center:
 $(h, k) \rightarrow (0, 3)$

Describe
 $a = -1$ Vertical and vert. reflection shift up 1

Domain: $(-\infty, \infty)$

Range: $(-\infty, 3]$



x	$y = -x^2 + 3$
-2	$-(-2)^2 + 3 = -1$
-1	$-(-1)^2 + 3 = 2$
0	$-(0)^2 + 3 = 3$
1	$-(1)^2 + 3 = 2$
2	$-(-2)^2 + 3 = -1$

This is a good video to watch to have horizontal dilations explained more!

<https://www.youtube.com/watch?v=RnF3bpPkIQM>

Graph and Describe the Transformation

$$y = \sqrt{-3x} + 4$$

Parent Function

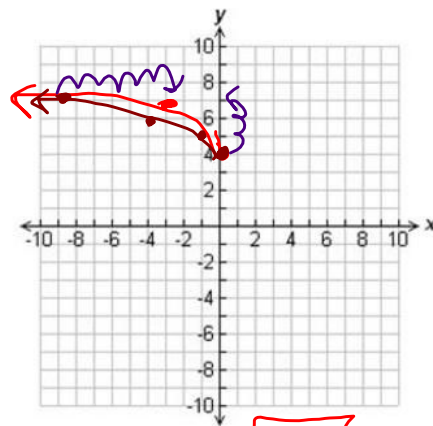
Abs. Value

Parent Equation

$$y = |x|$$

New Vertex/Center:

$$(0, 4)$$



Describe

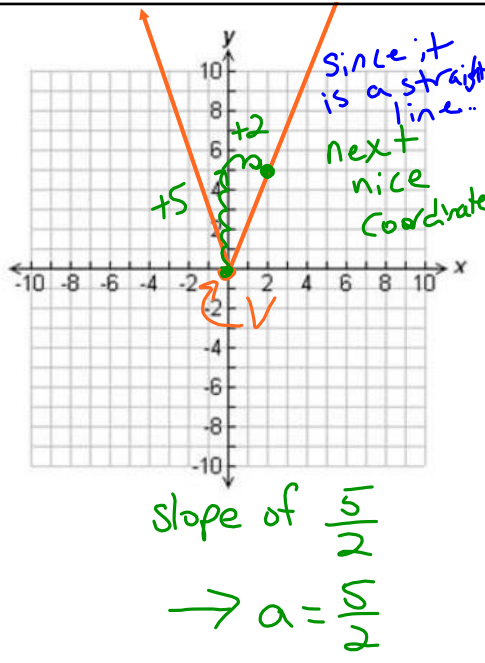
$a = -3$ Horizontal
shrink by $\frac{1}{3}$
& Horizontal reflection

Domain: $(-\infty, 0]$

Range: $[4, \infty)$

x	$y = \sqrt{-3x} + 4$
-3	$\sqrt{-3(-3)} + 4 = 7$
0	$\sqrt{-3(0)} + 4 = 4$
-3	$\sqrt{-3(3)} + 4 = \text{imag}$

<p>Graph and Describe the Transformation</p>	<p>Parent Function <i>absolute value</i></p> <p>Parent Equation $y = x$</p> <p>New Vertex/Center: $(0,0)$</p> <p>Describe <i>Vertical stretch by $\frac{5}{2}$</i></p> <p>Transformed Equation $y = \frac{5}{2} x-0 +0$ $y = \frac{5}{2} x$</p> <p>Domain: $(-\infty, \infty)$</p> <p>Range: $[0, \infty)$</p>
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<p>Graph and Describe the Transformation</p>	<p>Parent Function <i>Quadratic</i></p> <p>Parent Equation $y = x^2$</p> <p>New Vertex/Center: $(0,0)$</p> <p>Describe <i>Vertical Reflection over x axis</i> <i>Vertical shrink by $\frac{1}{2}$</i></p> <p>Transformed Equation $y = -\frac{1}{2}(x-0)^2+0$ $y = -\frac{1}{2}x^2$</p> <p>Domain: $(-\infty, \infty)$</p> <p>Range: $(-\infty, 0]$</p>
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