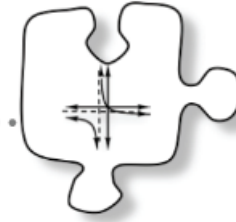


2.2.1 How can I transform any graph?



Transforming Other Parent Graphs

You have learned how to move a parabola around a set of axes, write equations, sketch graphs, and model situations using transformed parabolas. The graph of $y = x^2$ is called the **parent graph** for the family of parabolas because every other parabola is a transformation of that one graph.

2-25. In this investigation you will use what you have learned about transforming the graph of $y = x^2$ to transform five other parent graphs. In fact, your team will figure out how to use what you have learned to transform the graph of *any* function!



Your Task: As a team, determine how you can translate the graph of any function left, right, up, and down; how you can stretch or compress it vertically; and how you can reflect it over the x -axis. Each team member should investigate one of the following parent functions: $y = x^3$, $y = \frac{1}{x}$, $y = \sqrt{x}$, $y = |x|$, and $y = b^x$. (If you are investigating $y = b^x$, your teacher will give you a value to use for b .)

- Remember that to investigate completely, you should include a complete description of your graph.
- Graph and write an equation to demonstrate each transformation you find.
- Finally, write an equation in graphing form for your family of graphs.

Discussion Points

How can we transform a parabola?

How can we use our ideas about transforming parabolas to transform other functions?

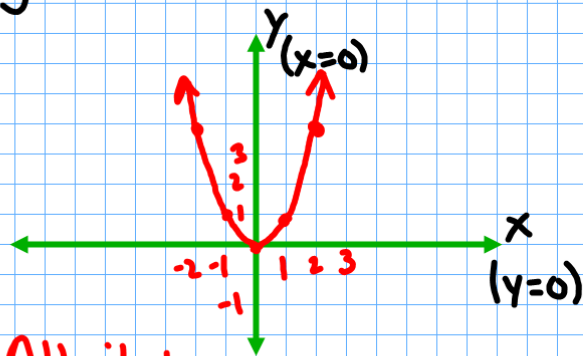
What changes can we make to the equation?

Parent
function

$$y = x^2$$

Family:
Quadratic

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Attributes:

Domain: $-\infty < x < \infty$ | $(-\infty, \infty)$ | \mathbb{R} Range: $y \geq 0$ | $[0, \infty)$ Symmetry: $X=0$

Asymptotes: None

Important
Points:

Vertex: $(0,0)$
 minimum
 x-int: $(0,0)$
 y-int

x	y
-3	9
-2	4
-1	1
0	0
.25	.0625
.33	.1111
.5	.25
1	1
2	4
3	9

Transformations:

 $y = (x-2)^2$ Right Shift

 $y = x^2 + 2$ Up Shift

 $y = \frac{1}{3}x^2$ Vertical Compress.

 $y = -x^2$ Reflection across
x-axis

★ Graphing form:

Parameters: a - Stretch factor | h - horiz. shift | k - Vertical shift

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

Parent Function	Function Family	Notebook Page	Team Start
$y = x^2$	Quadratic	30	G ✓
$y = x^3$	Cubic	31	G
$y = \frac{1}{x}$	Reciprocal (Hyperbola)	32	B
$y = \sqrt{x}$	Square Root	33	C
$y = x $	Absolute Value	34	D
$y = 2^x$	Exponential	35	E
$y = 1$	Linear (Constant)	36	F
$x = 1$	Linear (non-function)	37	A
$y = x$	Linear	38	H

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Parent Function	Function Family	Notebook Page	Team Start
$y = x^2$	Quadratic	30	✓
$y = x^3$	Cubic	31	G
$y = \frac{1}{x}$	Reciprocal (Hyperbola)	32	H
$y = \sqrt{x}$	Square Root	33	B
$y = x $	Absolute Value	34	C
$y = 2^x$	Exponential	35	E
$y = 1$	Linear (Constant)	36	D
$x = 1$	Linear (non-function)	37	F
$y = x$	Linear	38	A

See template for suggestion in notebook.

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Parent Function	Function Family	Notebook Page	Team Start
$y = x^2$	Quadratic	30	✓
$y = x^3$	Cubic	31	F
$y = \frac{1}{x}$	Reciprocal (Hyperbola)	32	G
$y = \sqrt{x}$	Square Root	33	H
$y = x $	Absolute Value	34	C
$y = 2^x$	Exponential	35	B
$y = 1$	Linear (Constant)	36	D
$x = 1$	Linear (non-function)	37	F
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Parent Function	Function Family	Notebook Page	Team Start
$y = x^2$	Quadratic	30	D
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$y = \sqrt{x}$	Square Root	33	H
$y = x $	Absolute Value	34	C
$y = 2^x$	Exponential	35	B
$y = 1$	Constant	36	F
$y = x$	Linear	37	A

1

	Quadratic $y = x^2$	Cubic $y = x^3$	Reciprocal $y = \frac{1}{x}$	Square Root $y = \sqrt{x}$	Absolute Value $y = x $	Exponential $y = 2^x$	Constant $y = 0$	Constant $x = 0$	Linear $y = x$
A	✓								✓
B	✓					✓			
C	✓				✓				
D	✓						✓		
E	✓	✓							
F	✓						✓	✓	
G	✓		✓						
H	✓			✓			.		

PI

	Quadratic $y = x^2$	Cubic $y = x^3$	Reciprocal $y = \frac{1}{x}$	Square Root $y = \sqrt{x}$	Absolute Value $y = x $	Exponential $y = 2^x$	Constant $y = 0$	Constant $x = 0$	Linear $y = x$
A	✓								✓
B	✓								
C	✓								
D	✓								
E	✓								
F	✓								
G	✓	✓							
H	✓								

P5

	Quadratic $y = x^2$	Cubic $y = x^3$	Reciprocal $y = \frac{1}{x}$	Square Root $y = \sqrt{x}$	Absolute Value $y = x $	Exponential $y = 2^x$	Constant $y = 0$	Constant $x = 0$	Linear $y = x$
A	✓							✓	
B	✓								
C	✓			✓					
D	✓								
E	✓								
F	✓								
G	✓	.							
H	✓								✓

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