Section 1.5 - Transformations of Quadratics

Learning Goal:

By the end of today, I will be able to recognize and apply transformations to a base ($f(x) = x^2$) quadratic function.

Sep 16-10:25 PM

Quadratic Forms Review

Standard Form

Factored Form

Vertex Form

Sep 16-10:31 PM

Summary of leading coefficient behaviour:

$$g(x) = ax^2$$

Note: $f(x)=x^2$ is the *base function* or *parent function*

Size of a
-if $a>1$, this is a vertical stretch (it gets tall and thin)

-if $0<a<1$, this is a vertical compression (it gets short and stout)

Sign of a
-if a is positive, the parabola opens up (no reflection)

-if a is negative, the parabola opens down (reflection in x-axis)

Confirm using graphing technology:

$y = 2x^2$ $y = 0.2x^2$ $y = -3x^2$

Apr 20-10:28 AM

Summary of adding/subtracting behaviour (outside of the x squared term):

General Rule

$$g(x)= x^2 + k$$

k > 0 , translates UP "k" units (positive)

k < 0 , translates DOWN "k" units (negative)

Confirm Using Graphing Technology

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

Nov 24-9:11 AM

Summary of adding/subtracting behaviour (INside of the x squared term):

General Rule

$$g(x)=(\,x-(h)\,)^2$$

h > 0 , translates RIGHT "h" units (positive)

h < 0 , translates LEFT "h" units (negative)

Watch for the double negatives

$y=(x-2)^2$ $y=(x+4)^2$

Nov 24-9:14 AM

Describe the transformation for the following: (use up, down, left and right - verify with graphing technology)

$$y=x^2+8$$

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

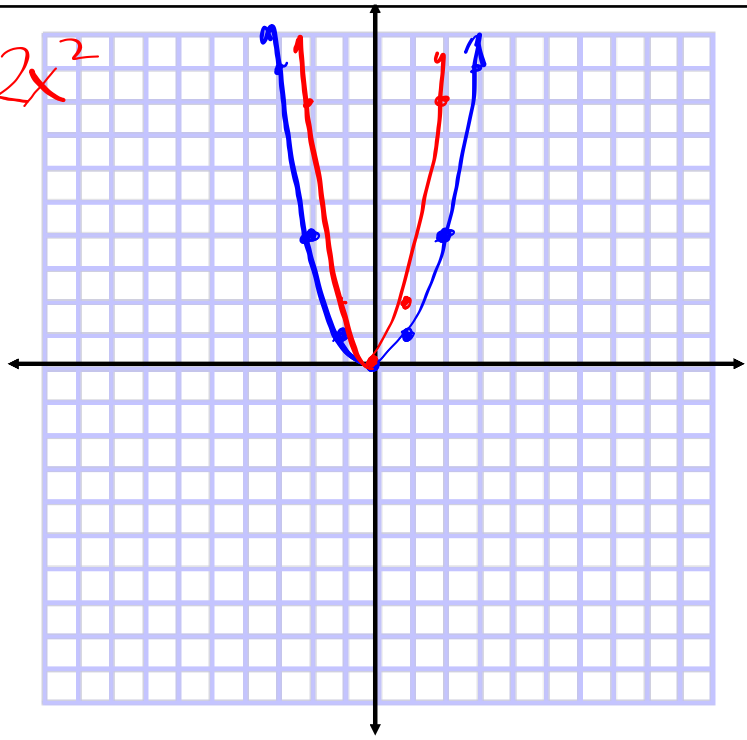
$$y=x^2-5$$

$$y=(x+4)^2+3$$

$$y=(x-3)^2+6$$

Nov 25-2:22 PM

$y = x^2$ $y=2x^2$



Sep 12-11:28 AM

When transformations all of the transformations are applied to the parent curve, the result can be summarized as follows:

$$f(x) = a(x-h)^2 + k$$

Describe the transformations of the following, then graph using technology:

$$f(x) = 2(x-3)^2 + 5$$

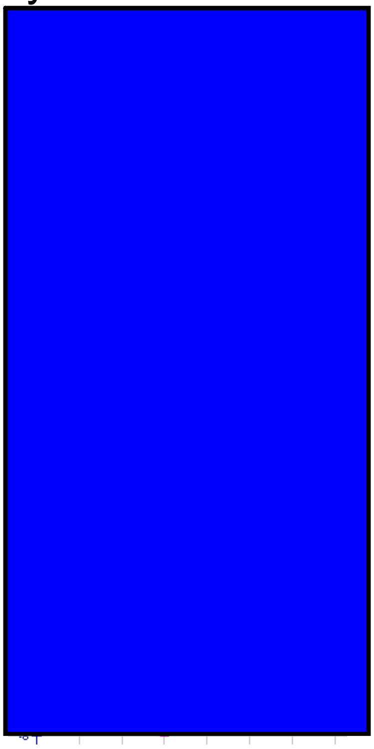
Apr 26-11:39 AM

$$f(x) = 2(x-3)^2 + 5$$

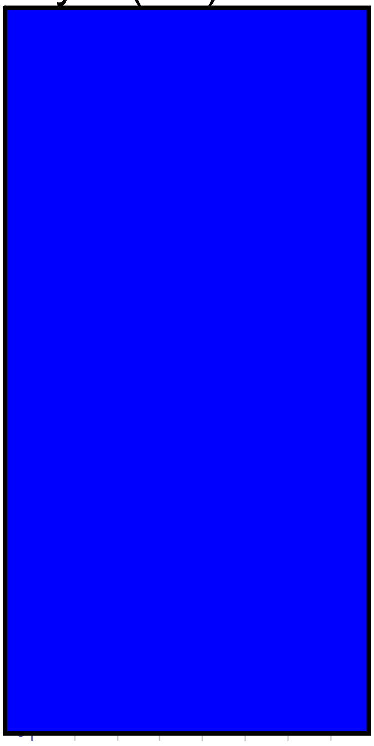
Sep 19-10:24 AM

Let's look at the graphs of the following:

$y=2x^2-12x+10$



$y=2(x-3)^2-8$



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Nov 24-2:39 PM

$$y=2(x-3)^2-8$$

Sep 16-10:22 AM

What quadratic form(s) allow us to "see" the quadratic graph most easily?

$y=2x^2-12x+10$ $y=2(x-3)^2-8$

Sep 16-10:33 PM

Steps to graph:

1/ Graph the parent function $f(x)=x^2$

2/ Apply the stretch/compression transformation.

3/ Apply the reflection transformation.

4/ Translate left/right and up/down.

(each transformed graph is essentially a "new" function)

$$z(x)=a(x-h)^2+k$$

move up or down

stretch/compression
reflection

move left or right

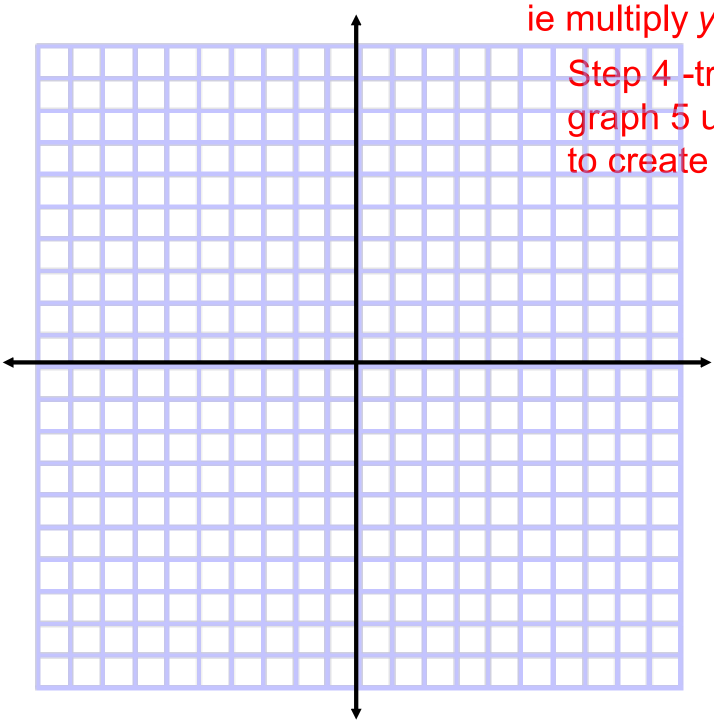
Apr 21-12:47 PM

Graph
$z(x)=-3(x+5)^2+1$

Step 1 - graph $f(x)=x^2$

Step 2 & 3
-reflect and stretch to create g(x)
ie multiply *y* values by -3

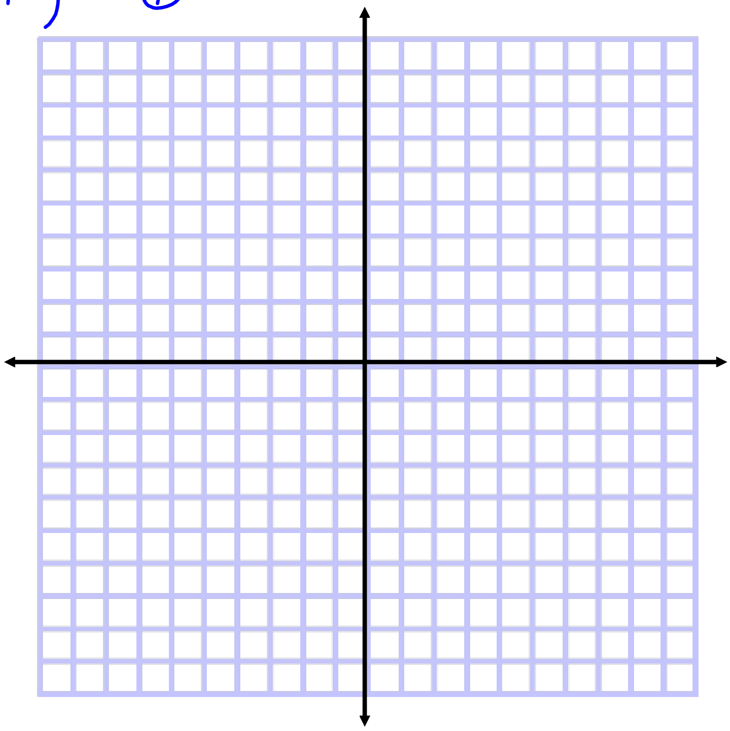
Step 4 -translate (move) the graph 5 units left and 1 unit up to create z(x)



Nov 24-2:50 PM

Graph the following:

$$y = \frac{1}{2}(x-4)^2 - 6$$



Sep 19-10:41 AM

Graph

$$y = 3(x+2)^2 - 5$$

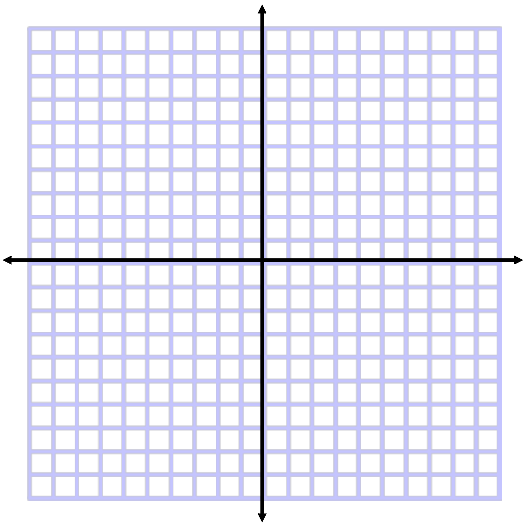
$$y = -\frac{1}{2}x^2 + 6$$

Sep 19-10:48 AM

Apply the following transformations to f(x) = x^2

(i) translate up 5 units

(ii) right 3 units



$$f(x)=(x)^2$$

$$g(x)=f(x)+5$$
$$g(x)=x^2+5$$

$$z(x)=g(x-3)$$
$$z(x)=(x-3)^2+5$$

$$y=-\frac{3}{4}(x+2)^2+3$$

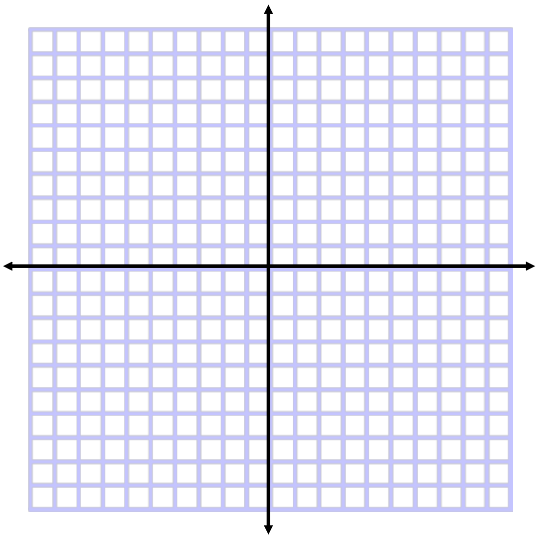
Apr 30-11:42 AM

Apply the following transformations to f(x) = x^2

(i) vertically stretch by 3

(ii) left 4 units

(iii) down 2 units



$$f(x)=(x)^2$$

$$g(x)=3f(x)$$
$$g(x)=3x^2$$

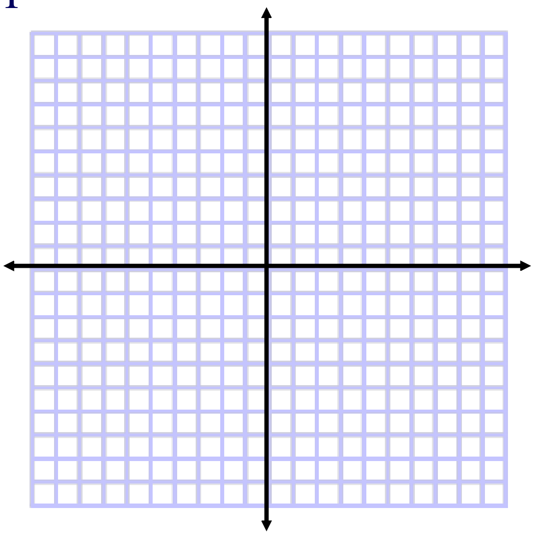
$$h(x)=g(x+4)$$
$$h(x)=3(x+4)^2$$

$$z(x)=h(x)-2$$
$$z(x)=3(x+4)^2-2$$

Apr 30-11:42 AM

State the transformations applied to the following and then Graph:

$$y = -2(x-5)^2 + 4$$



vertically stretch by factor of 2

up 4

$$y = -2(x-5)^2 + 4$$

reflection in x-axis

right 5

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Homework

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Is it possible for a quadratic relationship to NOT have any X intercepts?

What might the equation of that graph look like?

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