

Transformations of Functions

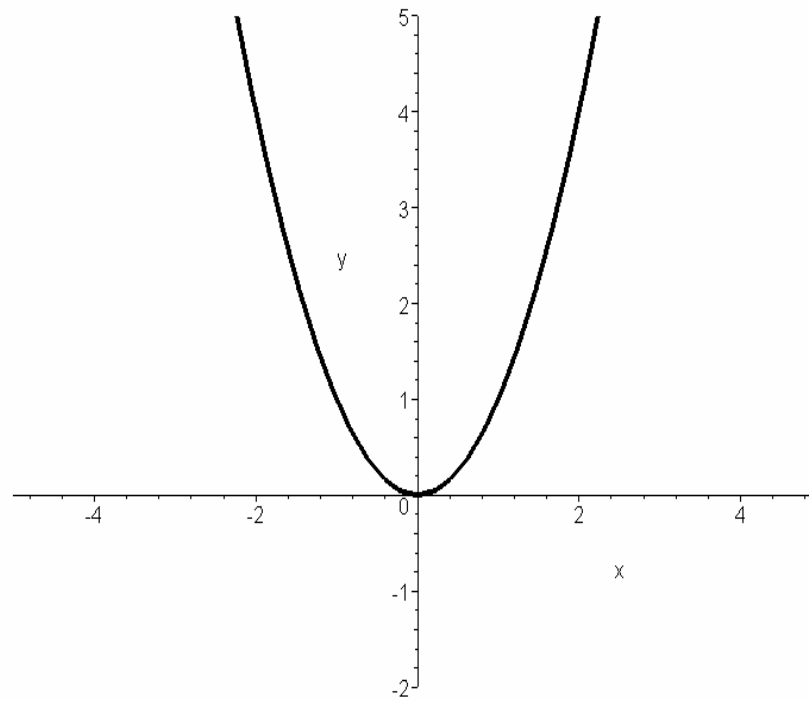
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MEnTe

**Mathematics Enrichment
through Technology**



Graph

$$y = x^2$$



Given the following function,

$$y = x^2 + a$$

If: $a > 0$, then shift the graph “ a ” units up

If: $a < 0$, then shift the graph “ a ” units down

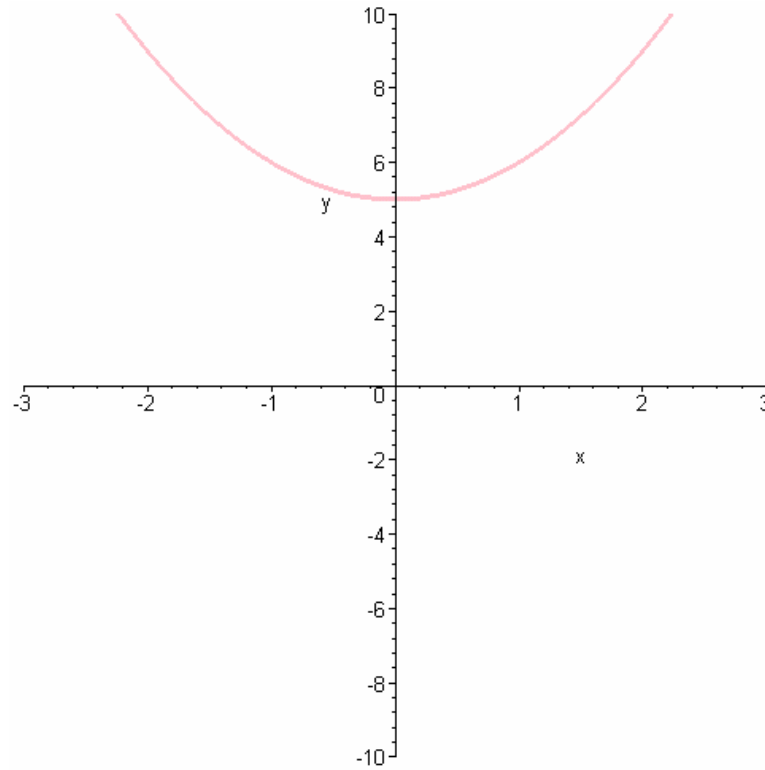
Given the following function,

$$y = x^2 + 5$$

Since $a > 0$, then the graph will be
shift up “5” units

Let's graph

$$y = x^2 + 5$$



Given the following function,

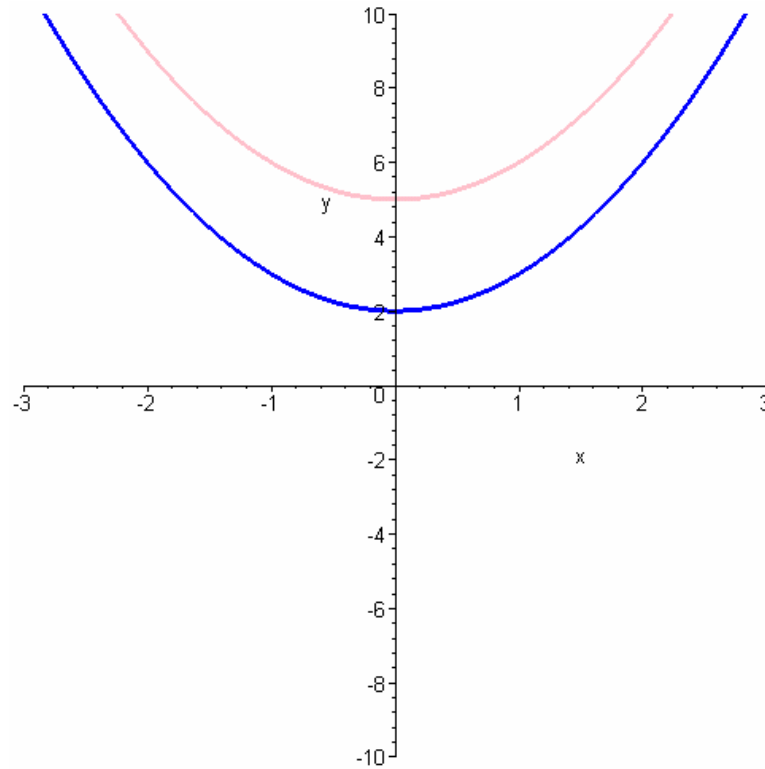
$$y = x^2 + 2$$

How will the graph look?

Let's graph

$$y = x^2 + 5$$

$$y = x^2 + 2$$



Given the following function,

$$y = x^2 - 3$$

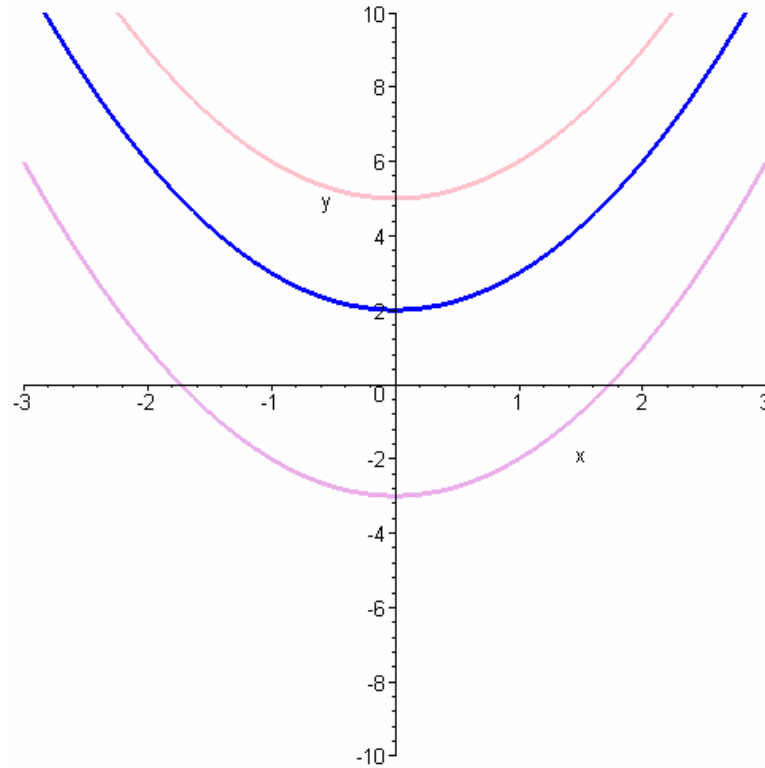
Since $a < 0$, then the graph will be
shift down “3” units

Let's graph

$$y = x^2 + 5$$

$$y = x^2 + 2$$

$$y = x^2 - 3$$



Given the following function,

$$y = x^2 - 6$$

How will the graph look?

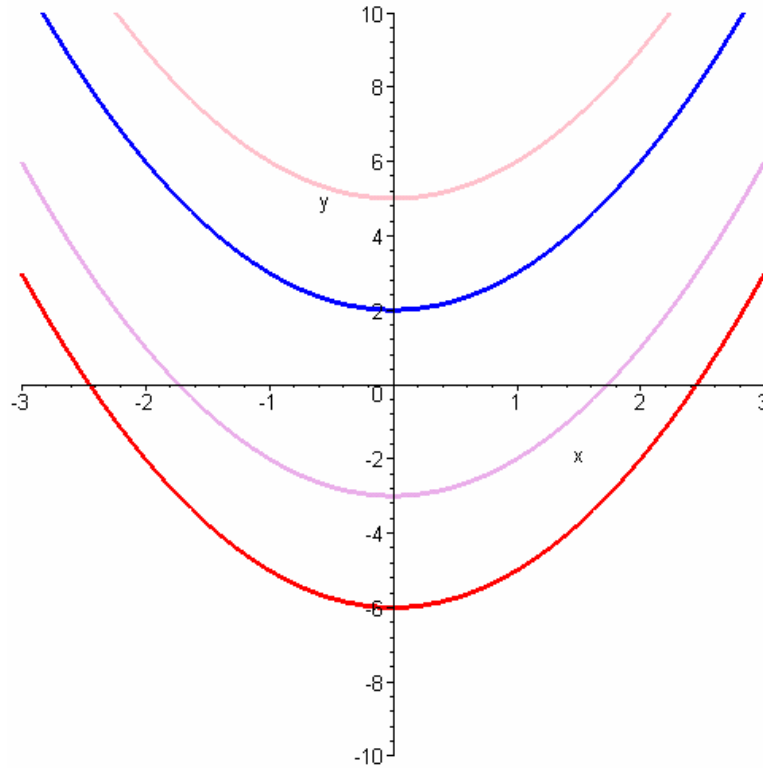
Let's graph

$$y = x^2 + 5$$

$$y = x^2 + 2$$

$$y = x^2 - 3$$

$$y = x^2 - 6$$



Given the following function,

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

For this equation, b is inside the parenthesis.

We get the expression and equal it to zero.

$$x - b = 0$$

$$x = b$$

If: $b > 0$, then shift the graph “ b ”
units right

If: $b < 0$, then shift the graph “ b ”
units left

Given the following function,

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

We get the expression and equal it to zero.

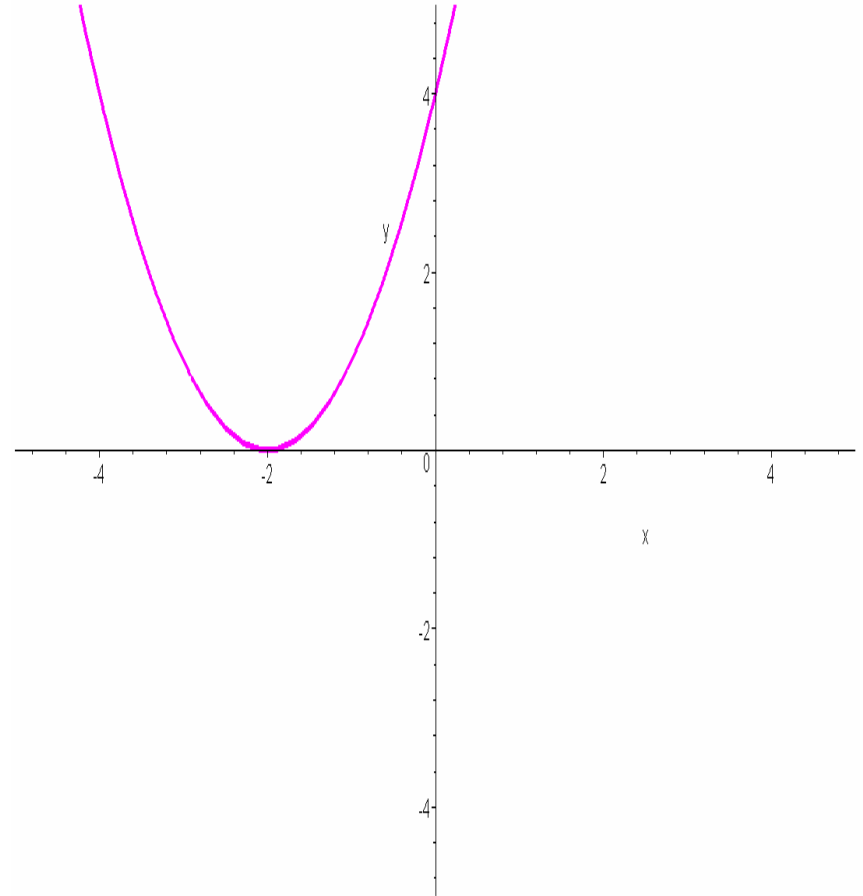
$$x + 2 = 0$$

$$x = -2$$

Since $b < 0$, then shift the graph
“2” units left

Let's graph

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



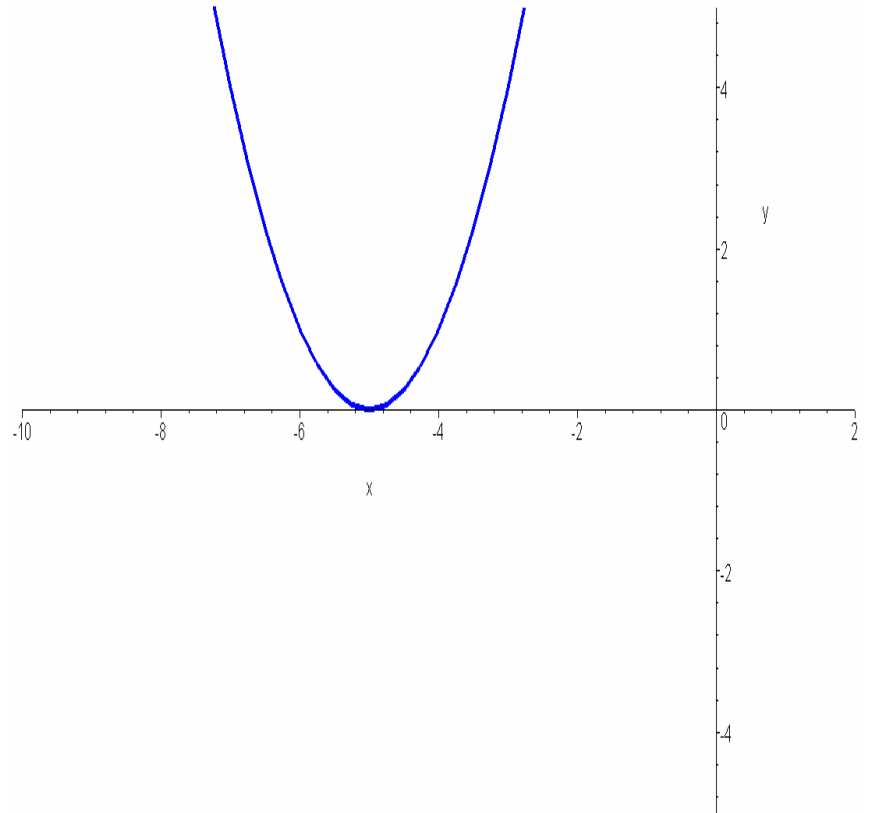
Let's graph

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

How will the
graph look?

Let's graph

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



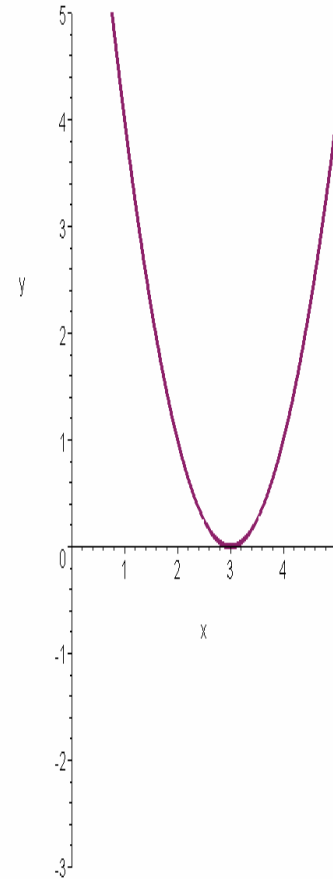
Let's graph

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

How will the
graph look?

Let's graph

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



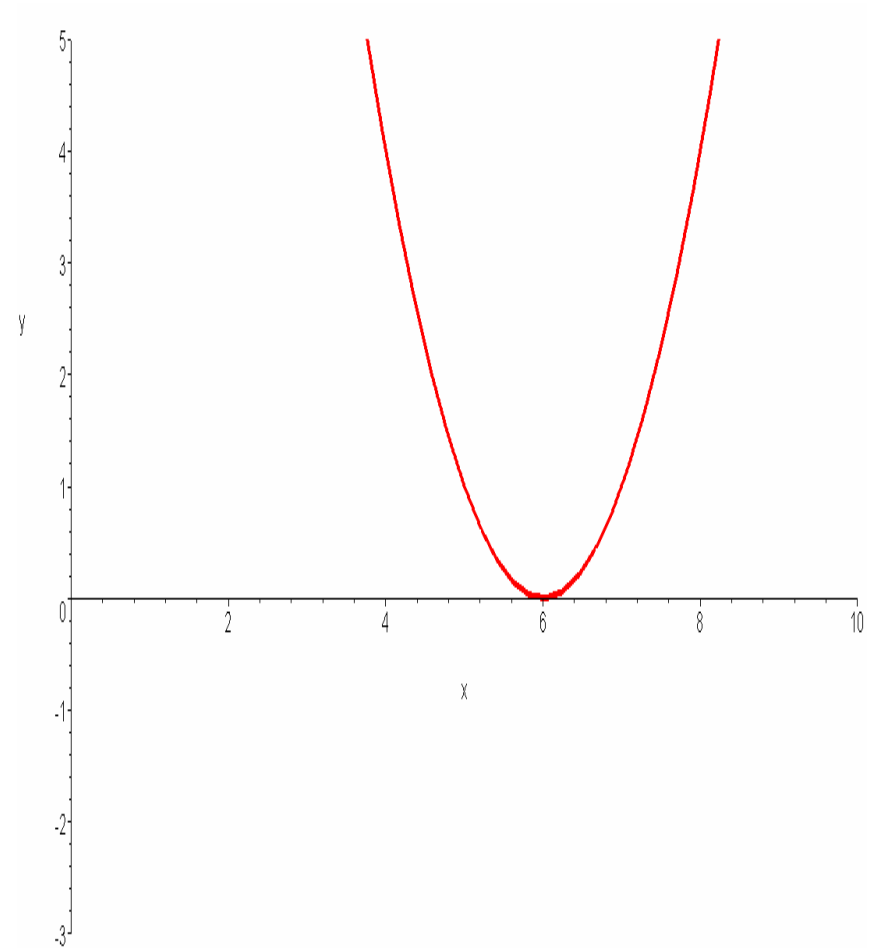
Let's graph

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

How will the
graph look?

Let's graph

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



Recall: $y = (x - b)^2 + a$

$a > 0$ then shift up

$a < 0$ then shift down

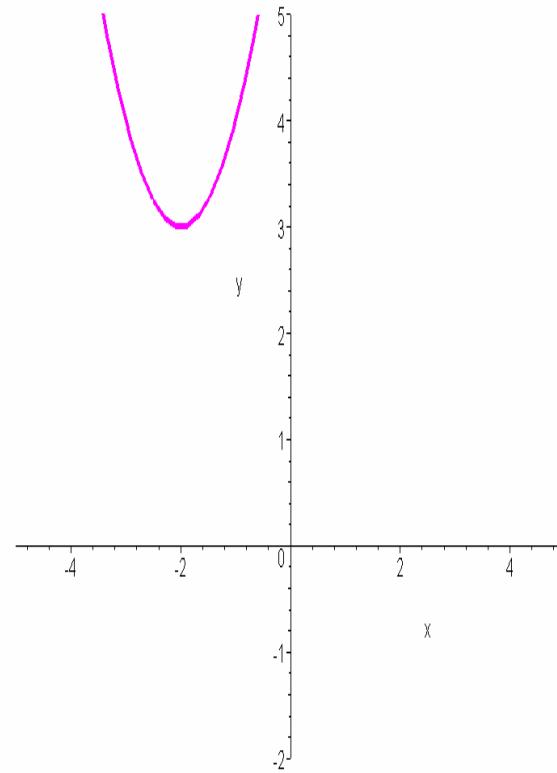
Equal the expression to zero

$$(x + 2) = 0$$

$b > 0$ then shift to the right

$b < 0$ then shift to the left

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



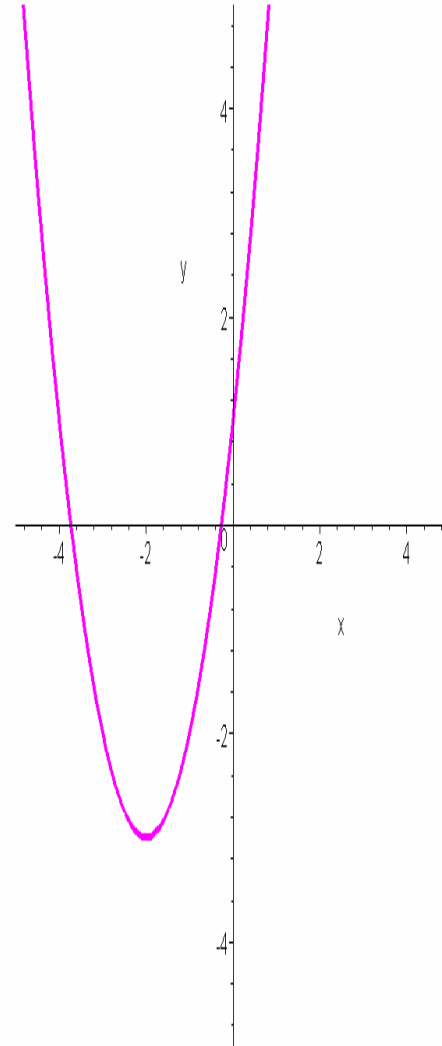
Let's graph

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

How will the
graph look?

Let's graph

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



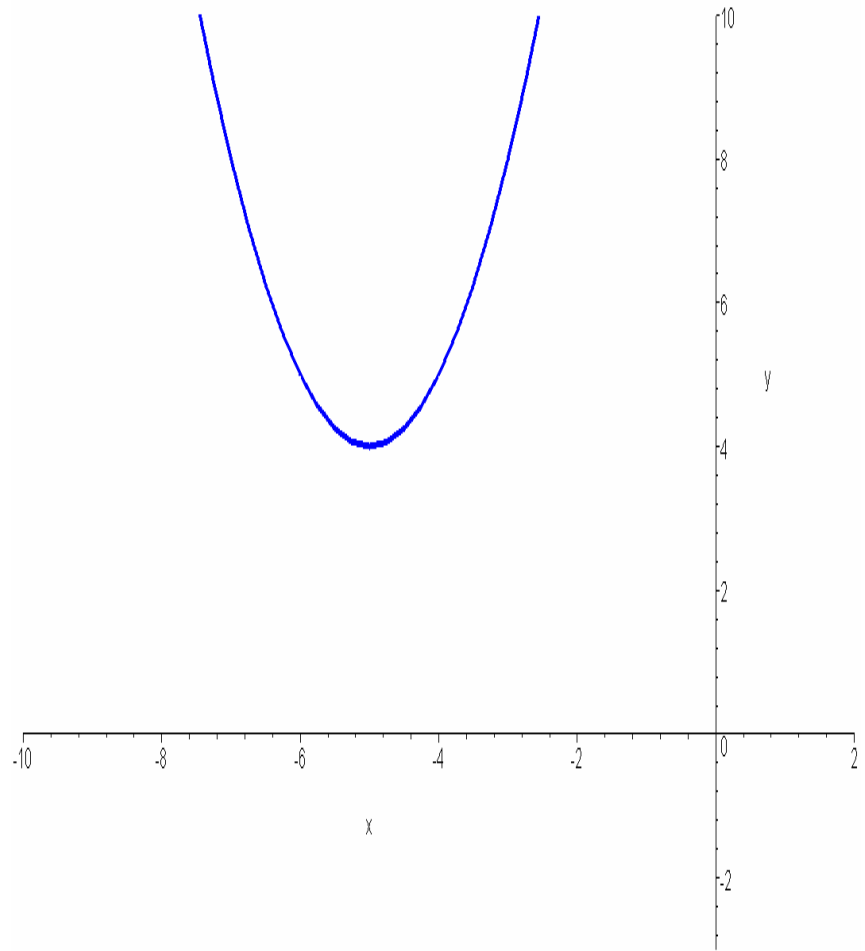
Let's graph

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

How will the
graph look?

Let's graph

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



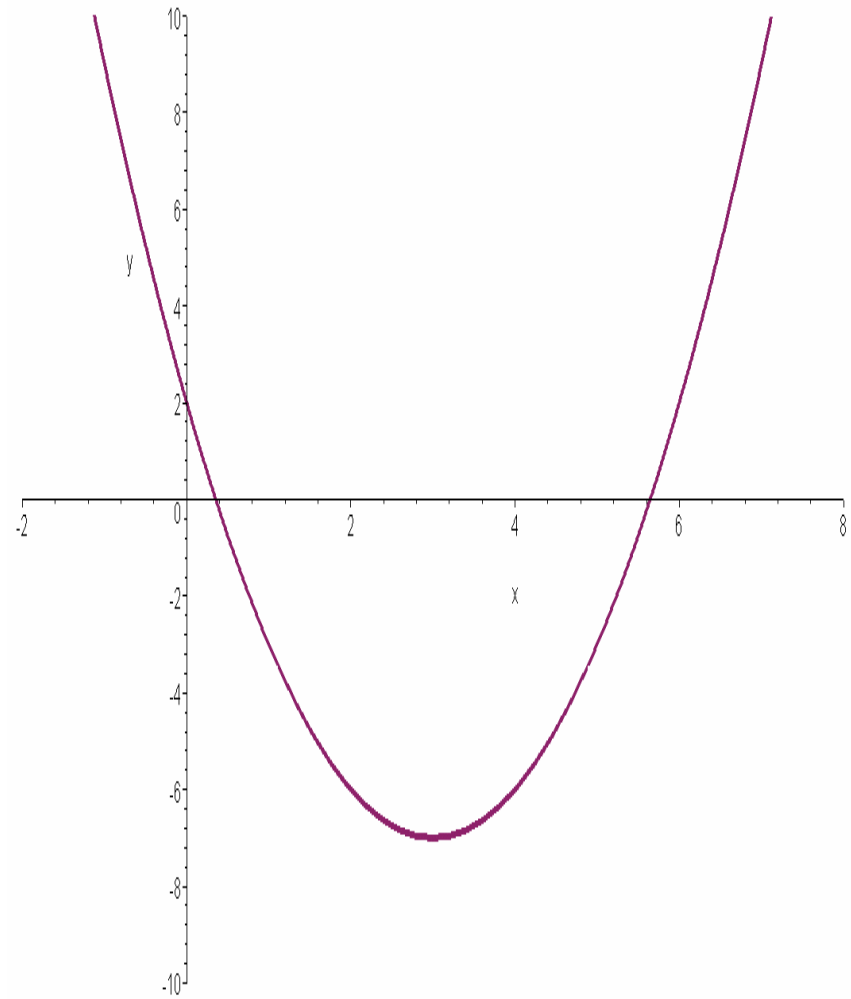
Let's graph

$$y = (x - 3)^2 - 7$$

How will the
graph look?

Let's graph

$$y = (x - 3)^2 - 7$$



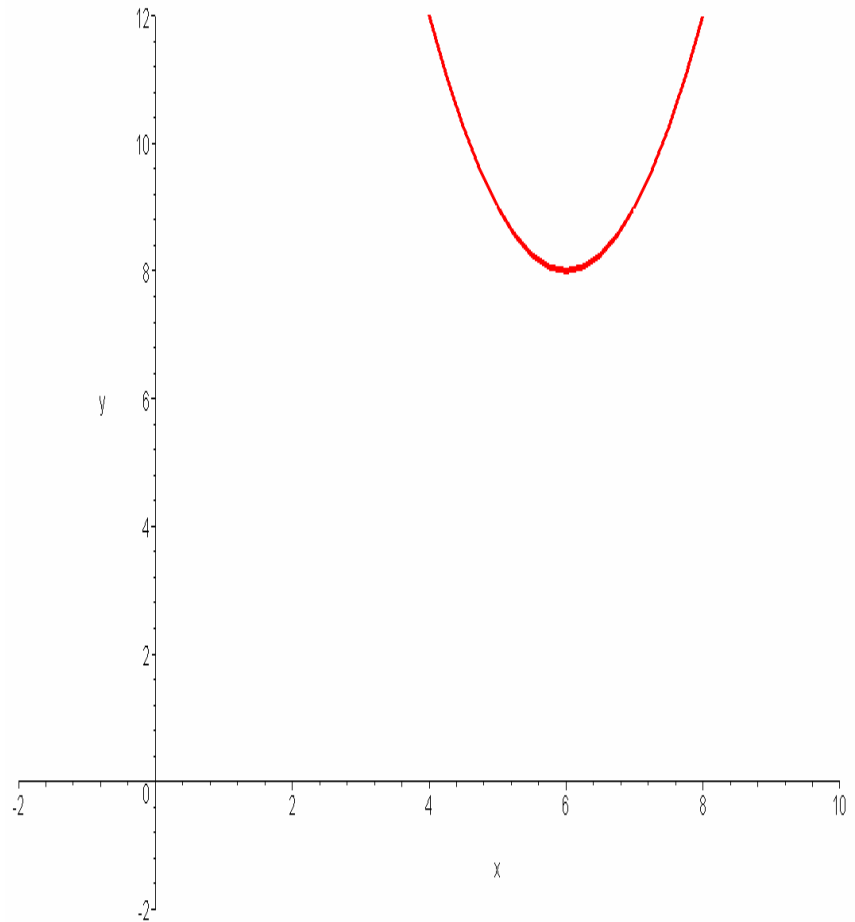
Let's graph

$$y = (x - 6)^2 + 8$$

How will the
graph look?

Let's graph

$$y = (x - 6)^2 + 8$$



Given the following function,

$$y = cx^2$$

For this equation, c determines how wide or thin the parabola will be.

if: $|c| > 1$, then the graph is closer to the y-axis

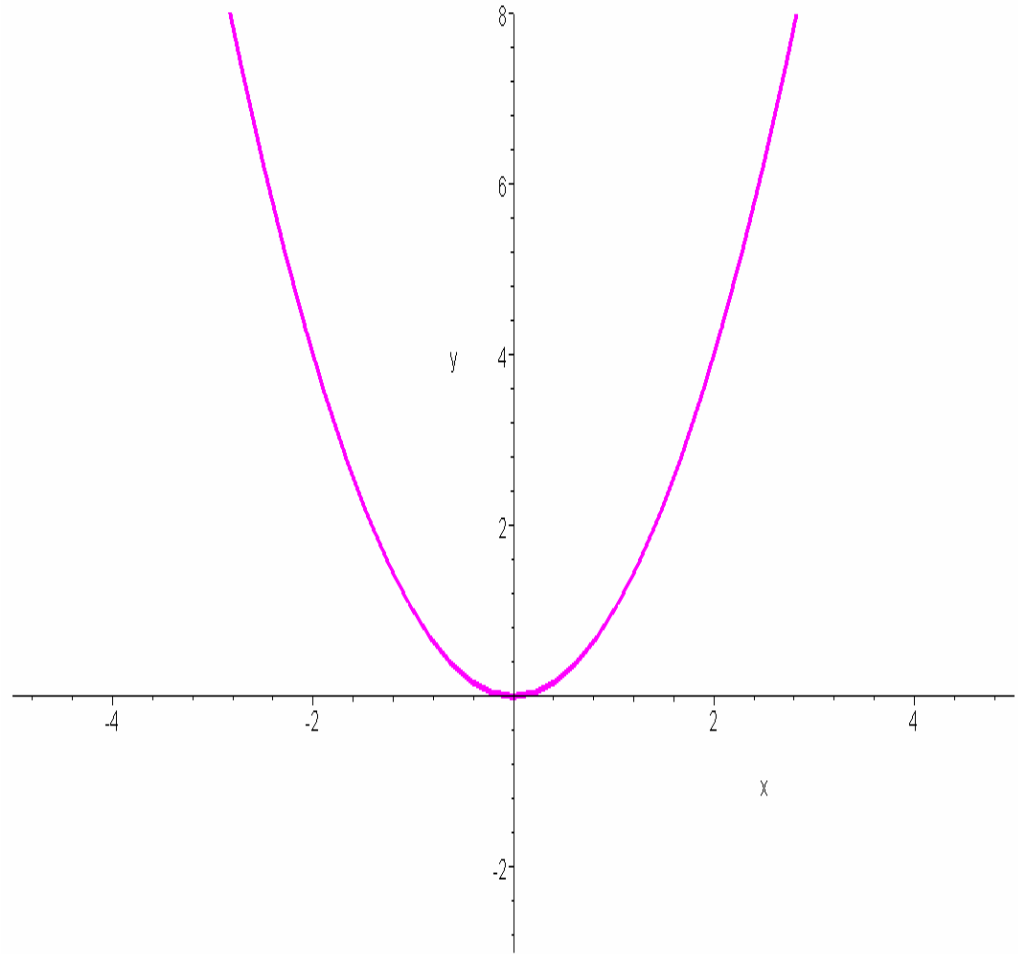
if: $|c| = 1$, then the graph remains the same

if: $0 < |c| < 1$, then the graph is further from the y-axis

if c is a negative number, then the graph will reflect on the x-axis

Let's graph

$$y = x^2$$



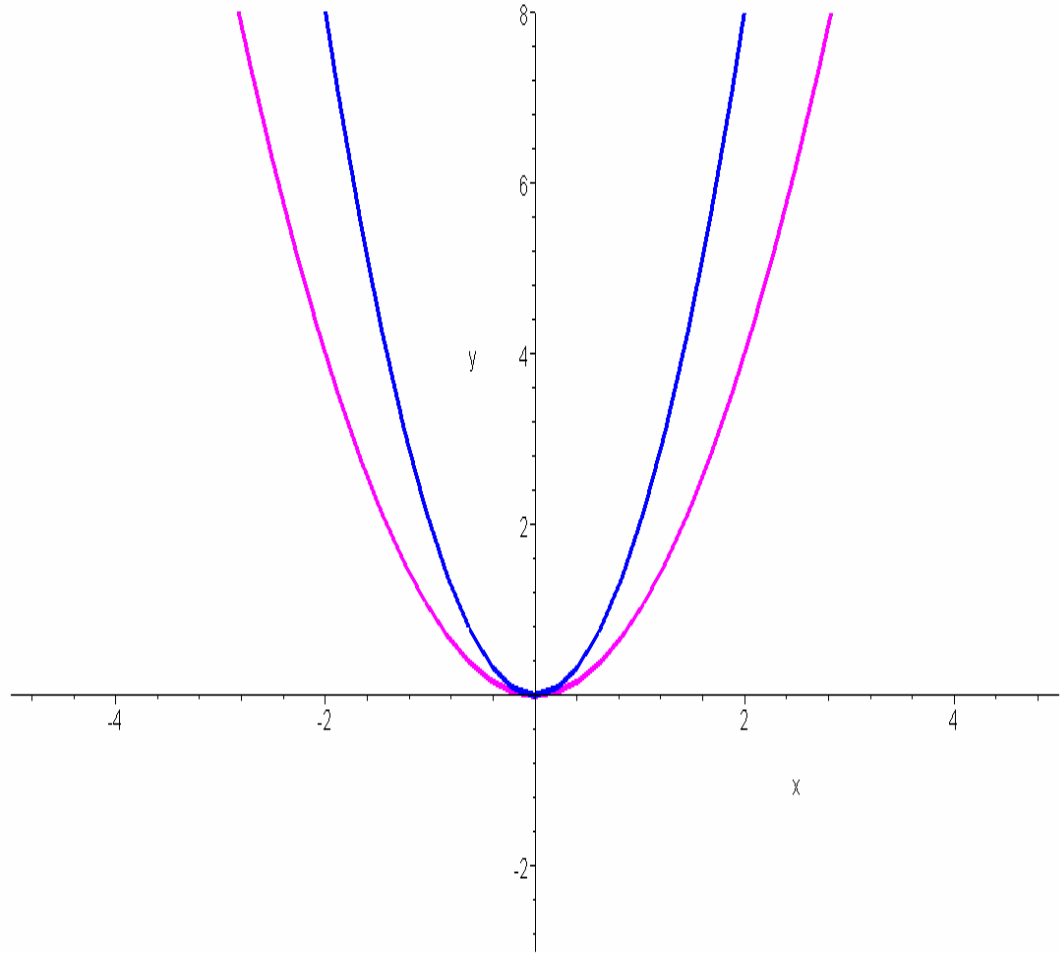
Given the following function,

$$y = 2x^2$$

Since $|c| > 1$, then the graph is
closer to the y -axis

Let's graph

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



Let's graph

$$y = \frac{2}{3}x^2$$

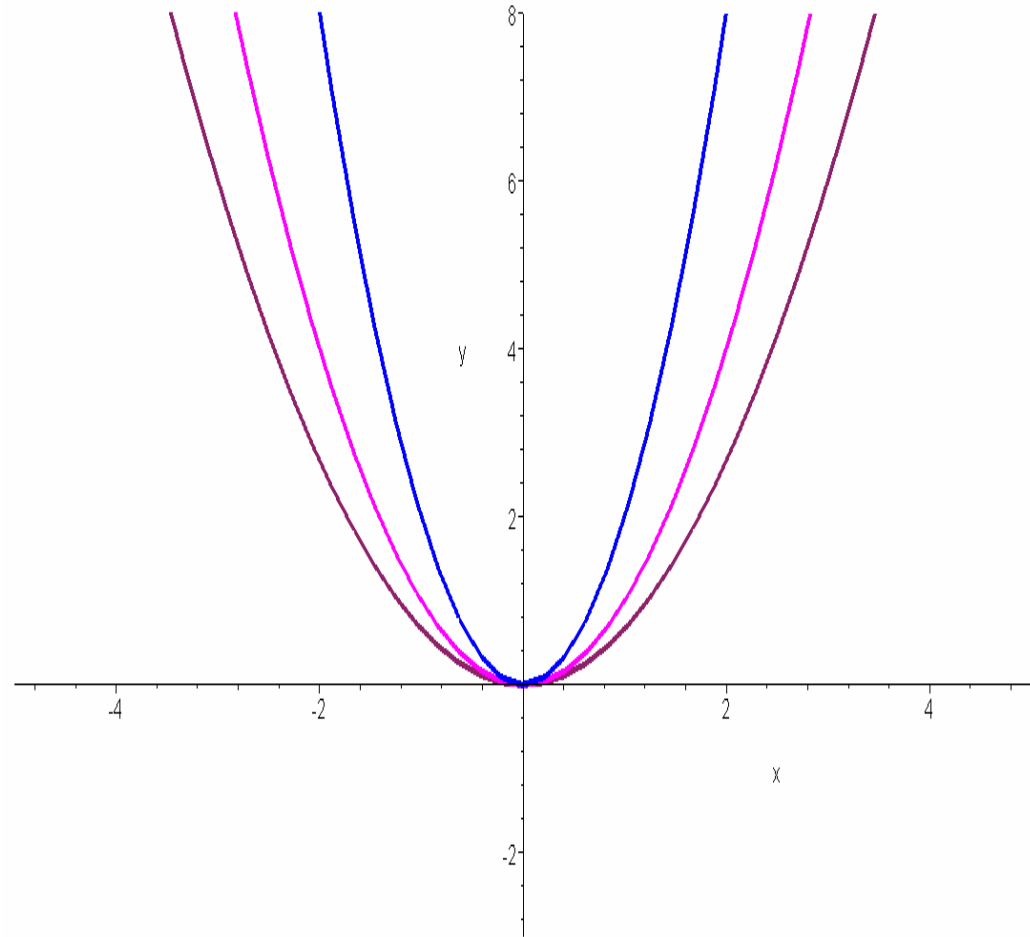
How will the graph look?

Let's graph

$$y = x^2$$

$$y = 2x^2$$

$$y = \frac{2}{3}x^2$$



Let's graph

$$y = \frac{5}{4}x^2$$

How will the graph look?

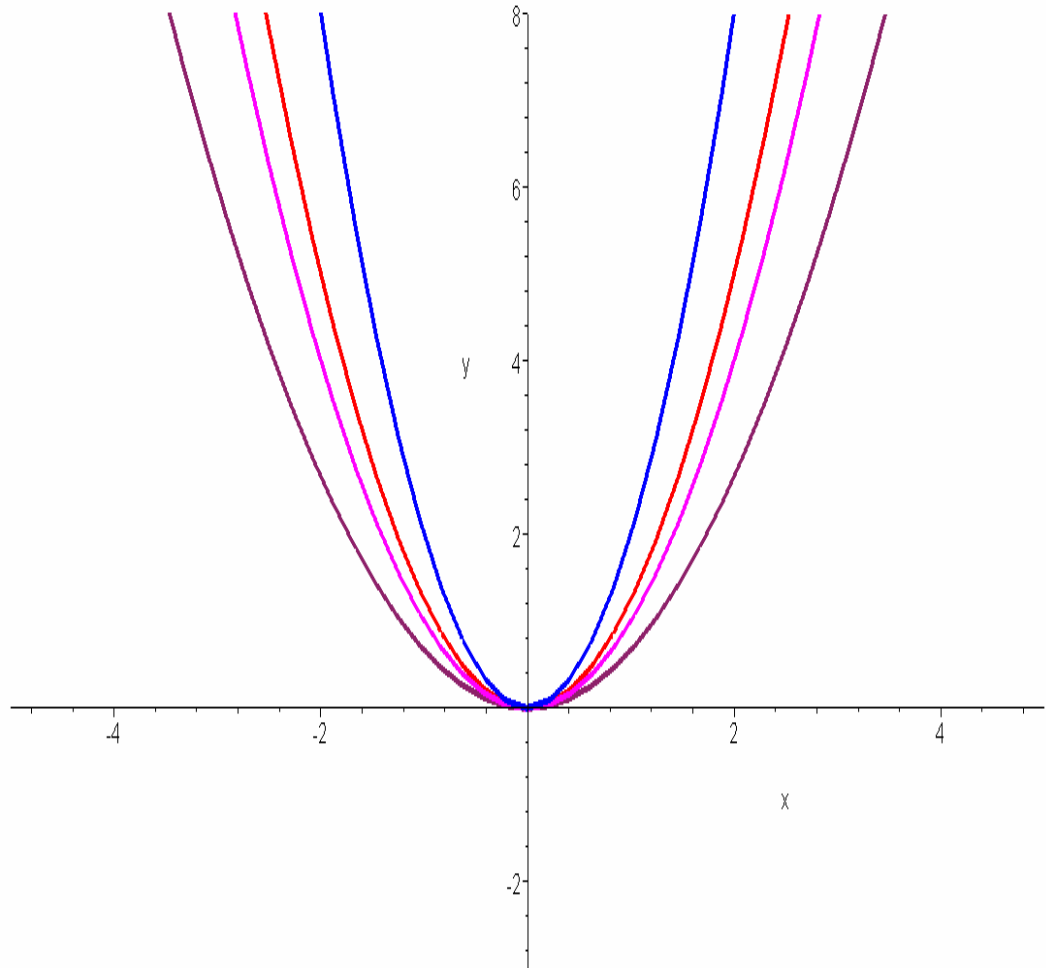
Let's graph

$$y = x^2$$

$$y = 2x^2$$

$$y = \frac{2}{3}x^2$$

$$y = \frac{5}{4}x^2$$



Recall: $y = c(x - b)^2 + a$

$a > 0$ then shift up

$a < 0$ then shift down

Equal the expression to zero

$$(x + 2) = 0$$

$b > 0$ then shift to the right

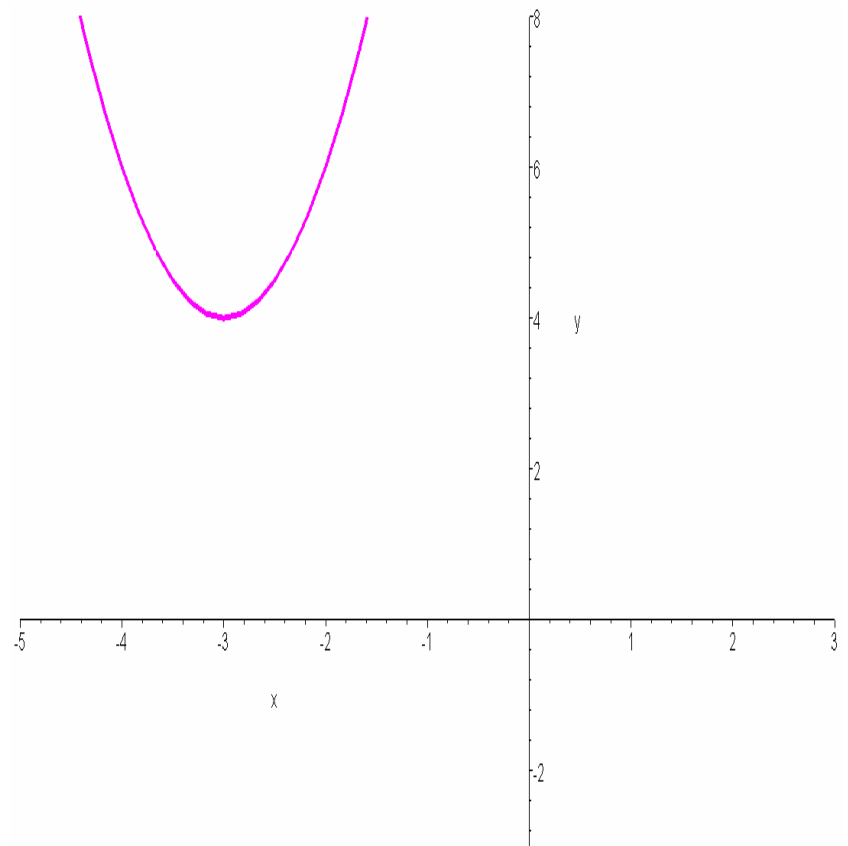
$b < 0$ then shift to the left

if: $|c| > 1$, then closer to the y axis

if: $|c| = 1$, then the graph is the
same

if: $0 < |c| < 1$, then further from
the y axis

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



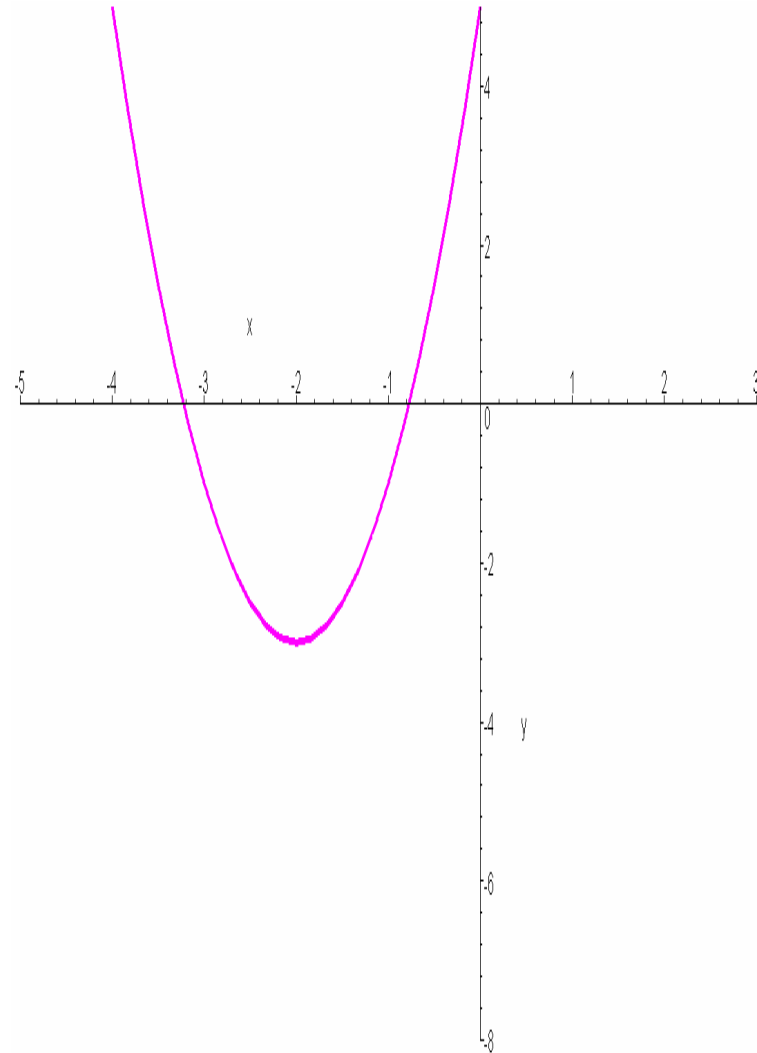
Let's graph

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

How will the
graph look?

Let's graph

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



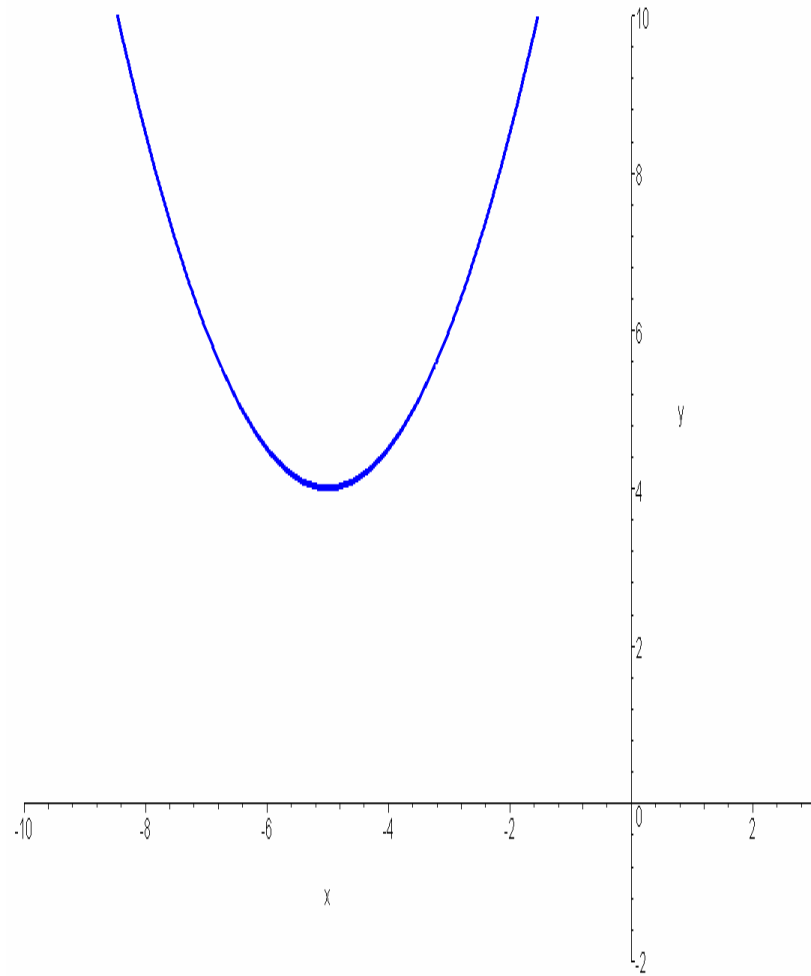
Let's graph

$$y = \frac{1}{2}(x + 5)^2 + 4$$

How will the graph look?

Let's graph

$$y = \frac{1}{2}(x + 5)^2 + 4$$



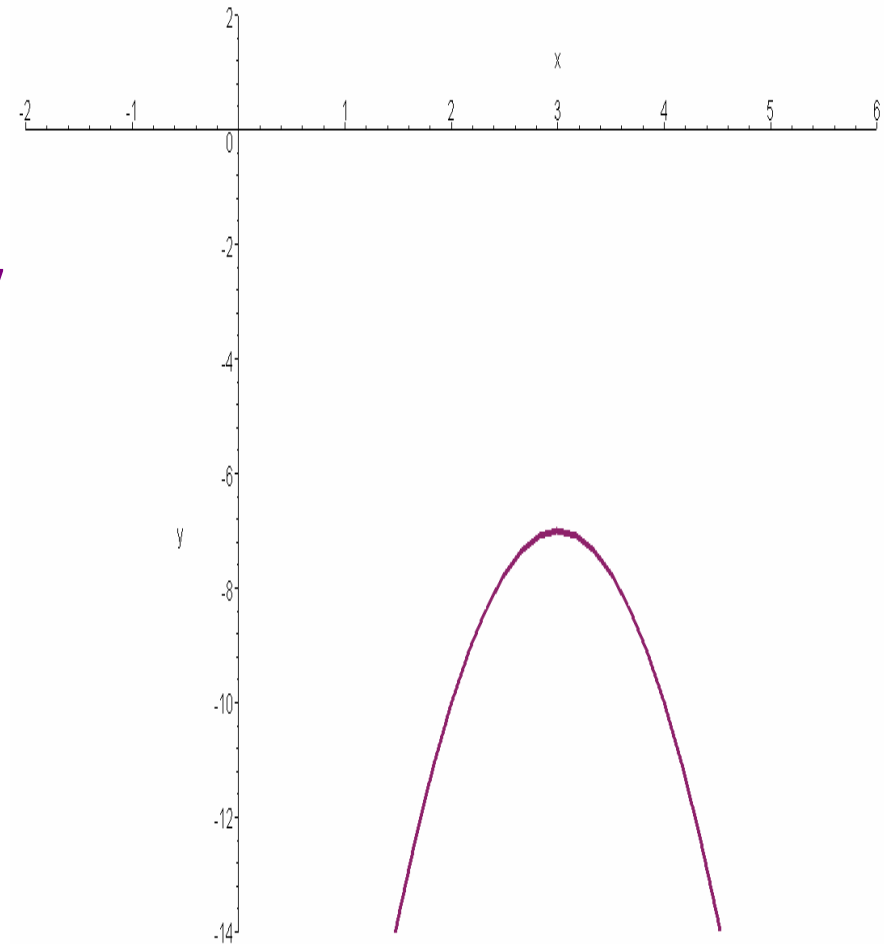
Let's graph

$$y = -3(x - 3)^2 - 7$$

How will the graph look?

Let's graph

$$y = -3(x-3)^2 - 7$$



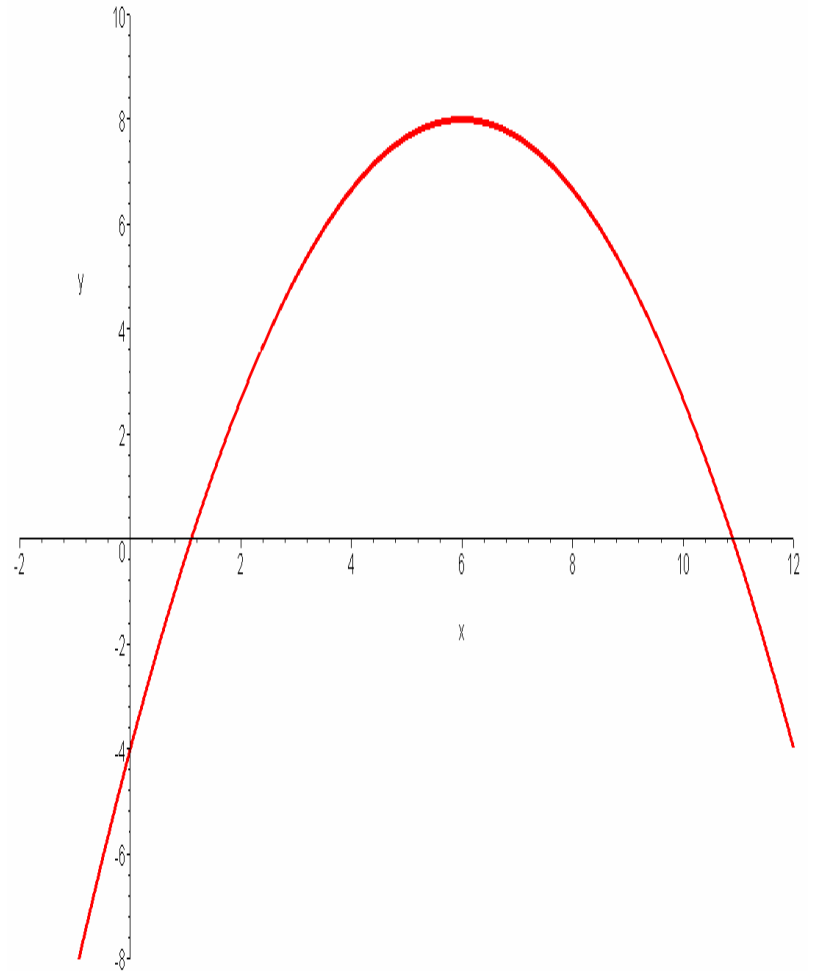
Let's graph

$$y = -\frac{1}{3}(x-6)^2 + 8$$

How will the graph look?

Let's graph

$$y = -\frac{1}{3}(x-6)^2 + 8$$



Congratulations!!

You just completed the
transformation of

$$y = x^2$$