11.2 Solve Quadratics Equations by Graphing

NOTES

SOLVE

0 =

Find the maximum or minimum point.

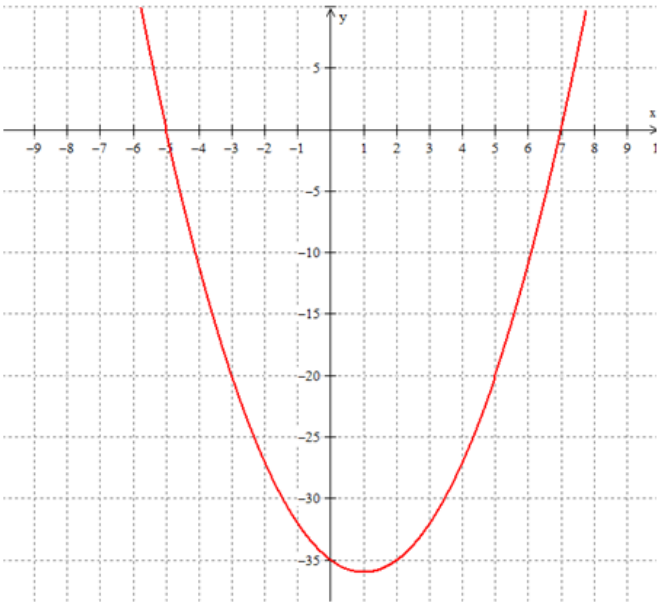
Solutions = Roots = Zeros = x-intercepts

Find the zeros

$f(x) = x^2 + 3x + 1$

What is the vertex?

Find the roots

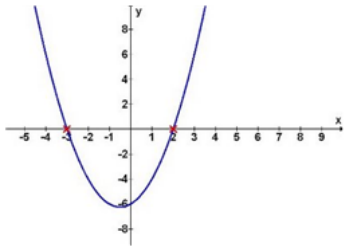


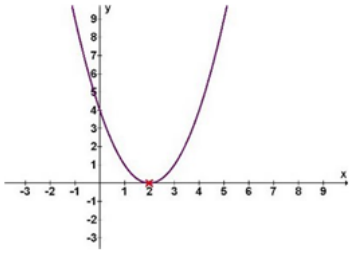
FIND THE SOLUTIONS

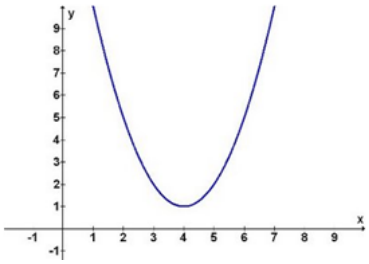
$x^2 + 7 =$

$-x^2 + 2x =$

How many solutions?







What causes a quadratic to have no solution?

A cliff diver stands on a 70 foot cliff. He jumps with an initial velocity of 8 ft/sec.

$$s(t) = -16t^2 + v_o t + h$$

$s(t)$ = height of object

v_o = initial velocity

h = initial height

Graph in the calculator with a "friendly window".

*x*min = *y*min =

*x*max = *y*max =

*x*scl = *y*scl =

When will the diver hit the water?

What is the diver's maximum height?

SUMMARIZE YOUR NOTES:

11.2 PRACTICE

Use CALCULATOR. Here is a quick reference sheet. You can NOT use this on Mastery Check or Test!!!

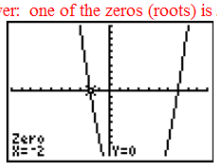
Find Roots!

Solve: $x^2 - 5x - 14 = 0$

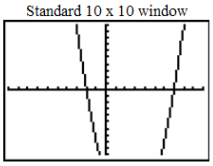
Since this equation is set equal to zero, the zeros (roots) will be the locations where the graph crosses the x-axis (if the roots are real numbers).

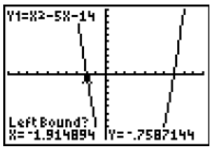
1. Set $Y_1 = x^2 - 5x - 14$
2. Use the ZERO command to find the zeros (roots) -- 2nd TRACE (CALC), #2 zero
3. Left bound? Move the spider as close to the zero (root --- where the graph crosses the x-axis) as possible. Hit the left arrow to move to the "left" of the zero (root). Hit ENTER. A "marker" ▶ will be set to the left of the zero (root).
4. Right bound? Move the spider as close to the zero (root --- where the graph crosses the x-axis) as possible. Hit the right arrow to move to the "right" of the zero (root). Hit ENTER. A "marker" ◀ will be set to the right of the zero (root).
5. Guess? Just hit ENTER.
6. Repeat the entire process to find other zeros (roots --- which in this case the second root happens to be $x = 7$).

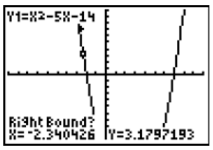
Answer: one of the zeros (roots) is $x = -2$

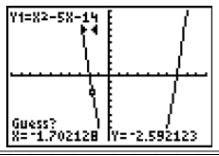


Standard 10 x 10 window



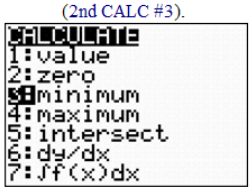




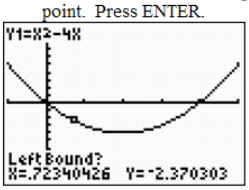


Find Vertex

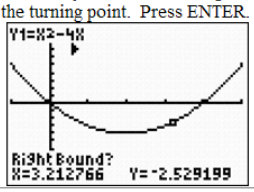
Locate minimum (2nd CALC #3).



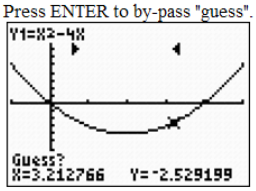
For the "left bound", choose any location to the left of the turning point. Press ENTER.



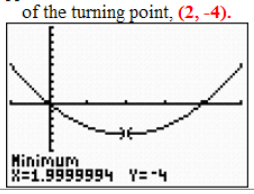
An anchor for the left position will appear. For the "right bound", choose any location to the right of the turning point. Press ENTER.



Press ENTER to by-pass "guess".



The minimum coordinates will appear. These are the coordinates of the turning point, **(2, -4)**.



Remember, when you see an answer such as 1.9999994, the actual answer is most likely 2. To verify, check the value $x = 2$ into the equation and the result will be $y = -4$.

USE CALCULATOR!

Find the zeros of the function

1. $f(x) = x^2 - x - 12$

2. $f(x) = x^2 + 3x - 10$

3. $f(x) = x^2 + x - 20$

4. $f(x) = x^2 - 12x + 11$

Solve the equation by graphing

5. $2x^2 + x = 3$

6. $4x^2 - 4x + 1 = 0$

7. $3x^2 + 1 = 2x$

USE CALCULATOR!

Sketch a ROUGH graph and find the zeros of the function to the nearest tenth

8. $f(x) = x^2 + 4x + 2$	8. $f(x) = x^2 - 5x + 3$
9. $f(x) = -x^2 + 7x - 5$	10. $f(x) = 2x^2 + x - 2$
11. $f(x) = 5x^2 + 30x + 30$	**CHALLENGE** **SOLVE** $\frac{1}{2}x^4 - 4x^2 + 2x = -3$

QUICK REVIEW

MULTIPLY	**FACTOR**	**FACTOR**
$(3x + 1)(2x - 5)$	$2x^3 - 18x$	$x^2 - x - 56$

11.2 APPLICATION!

1. Solve using the graphing calculator. (Round to nearest hundredth). $0 = -3x^2 + 4x + 5$	**2.** What is the minimum point of $(x) = 6x^2 + 2x - 3$?

TRANSLATIONS!

Translating a graph means sliding it around. Figure out how to move a parabola up/down/left/right using the calculator. Think Golden Arches where the left parabola slides over to make the right parabola

3. The most basic quadratic is $y = x^2$.
   Graph $y = x^2$ on calculator with a standard window.

4. Move your $y = x^2$ graph up 3 places. Write the equation that does this.

5. Move your $y = x^2$ graph down 5 places. Write the equation that does this.

6. Flip your $y = x^2$ graph upside down. Write the equation that does this.

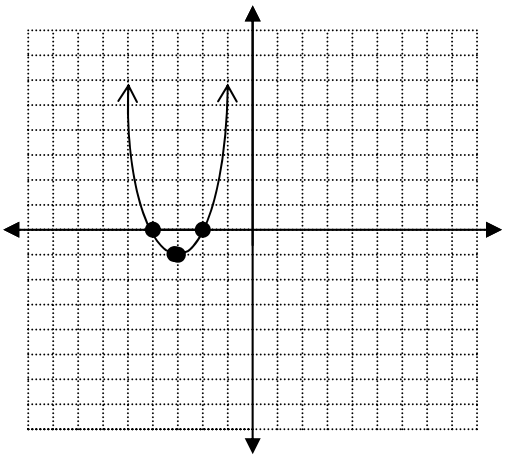
7. Graph $y = (x - 3)^2$. Describe its translation (how it moved) from the original graph of $y = x^2$.

8. Move your $y = x^2$ graph left 5 places. Write the equation that does this.

9. Move your $y = x^2$ graph right 2 places and up 4 places.
   Write the equation that does this.

10. Flip your $y = x^2$ graph upside down and move 1 left and 6 down.
    Write the equation that does this.

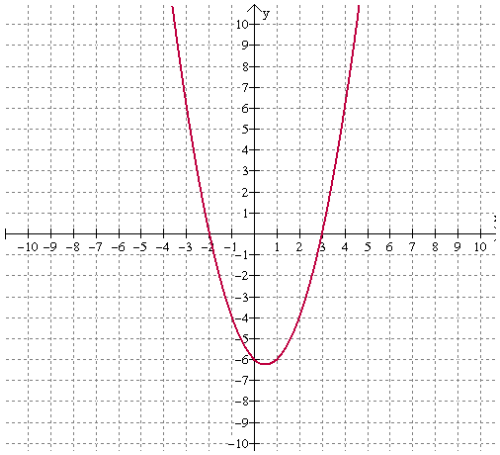
11. Write the equation of the following graph. →



12. So, in the formula if $y = ax^2 + bx + c$. If $a < 0$ (a is negative) does the parabola open up or down?

Identify the roots of the following quadratics. Roots are also called *x*-intercepts or solutions or zeros!

1.



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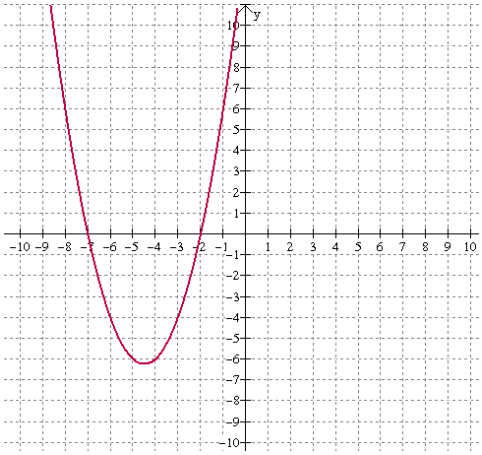

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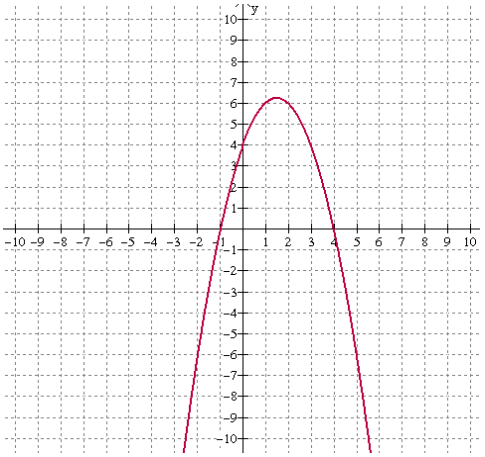

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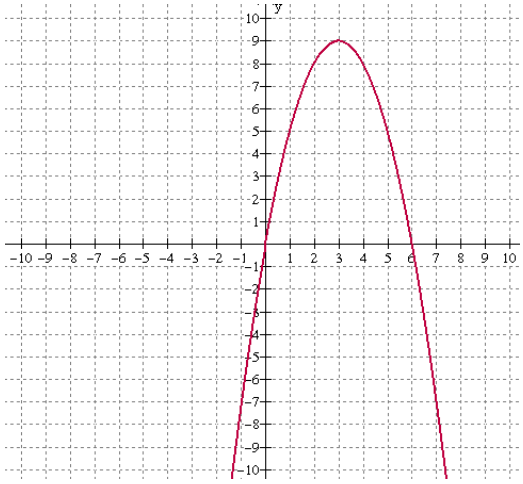

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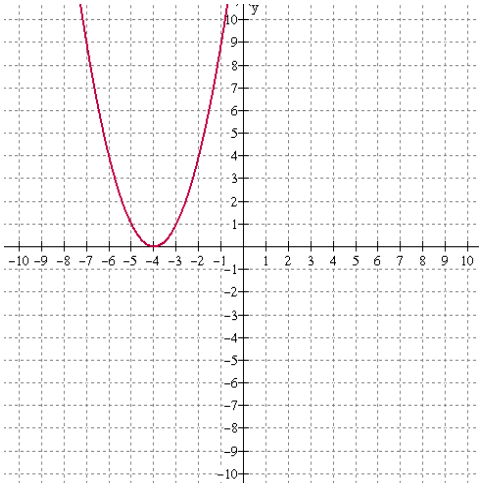

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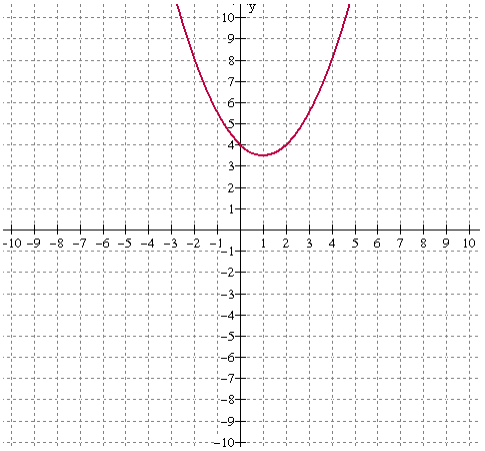

Coming Up…

1. $\left(\sqrt{7}\right)^2 =$

2. $\sqrt{3} \cdot \sqrt{3} =$

Find the area of the rectangle.

3.