

Learning Goal: By the end of today, we will be able to recognize properties and key features of a quadratic relationship from its given form (factored, standard, vertex), and use those properties to graph the quadratic.

Mar 27-12:41 PM

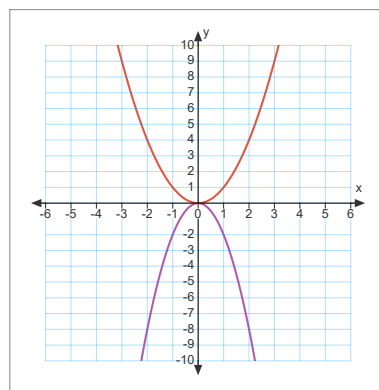
Quadratics and Second Differences
(read from left to right - neg. to positive)

X	Y	FD	SD
-2	4		
-1	1		
0	0		
1	1		
2	4		

$$y = x^2$$

X	Y	FD	SD
-2	-8		
-1	-2		
0	0		
1	-2		
2	-8		

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



Jul 14-3:55 PM

The equation for a parabola always has an x^2 -term (never a higher exponent)

$y = ax^2$ where $a > 0$

- the parabola opens up with a minimum vertex.
- the 2nd diff are positive

$y = ax^2$ where $a < 0$

- the parabola opens down with a maximum vertex.
- the 2nd diff are negative

Oct 16-11:35 AM

Quadratic Highlights:

The **maximum/minimum** value always occurs at the **vertex**.

The vertex is the only point on the **axis of symmetry**.

The x -value of the vertex is always the **average** of any 2 x -values that have the same y -value.

Illustration: $(x,y) \gg (2,7)$ and $(-3,7)$

$$x = \frac{2 + -3}{2}$$

$$x = -\frac{1}{2}$$

-Equation of the axis of symmetry $x=h$
 -Max/Min value = k (the y -value of the vertex)

Mar 21-10:28 AM

Summary - Quadratics

A quadratic relation can be recognized by the following:

- (i) equation - the largest exponent will be a "two"
- (ii) the graph will be in the shape of a parabola
- (iii) the table of values will have a SECOND difference that is constant

Standard Form $y = ax^2 + bx + c$ where "c" is the y intercept (0,c)

Factored Form $y = a(x - s)(x - t)$ where "s" and "t" are the Zeroes

and

X intercepts (s,0) and (t,0)

"a" for both will control if the parabola is "happy" (opens upward) or "sad" (open downward).

Apr 2-11:23 AM

State the transformations applied to the base curve $f(x)=x^2$

$$y = -2(x - 5)^2 + 9$$

Oct 28-8:59 PM

Enter the following into the graphing calculator:

$$y=2x^2 -4x - 6$$

y intercept

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

x intercepts

$$y=2(x-1)^2 - 8$$

Oct 28-8:37 PM

Vertex Form is the third and final form of the quadratic relationship, it provides the location of the vertex (h,k).

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

"a" is the same for all forms of the quadratic relationship and it determines the direction of opening and provides insight into the vertical transformation applied to the base curve.

The vertex form lets us know the location of the vertex without doing any algebraic manipulation.

Oct 28-8:44 PM

State the vertex for the following and whether it opens upward or downward:

$$y = 5(x - 1)^2 + 9$$

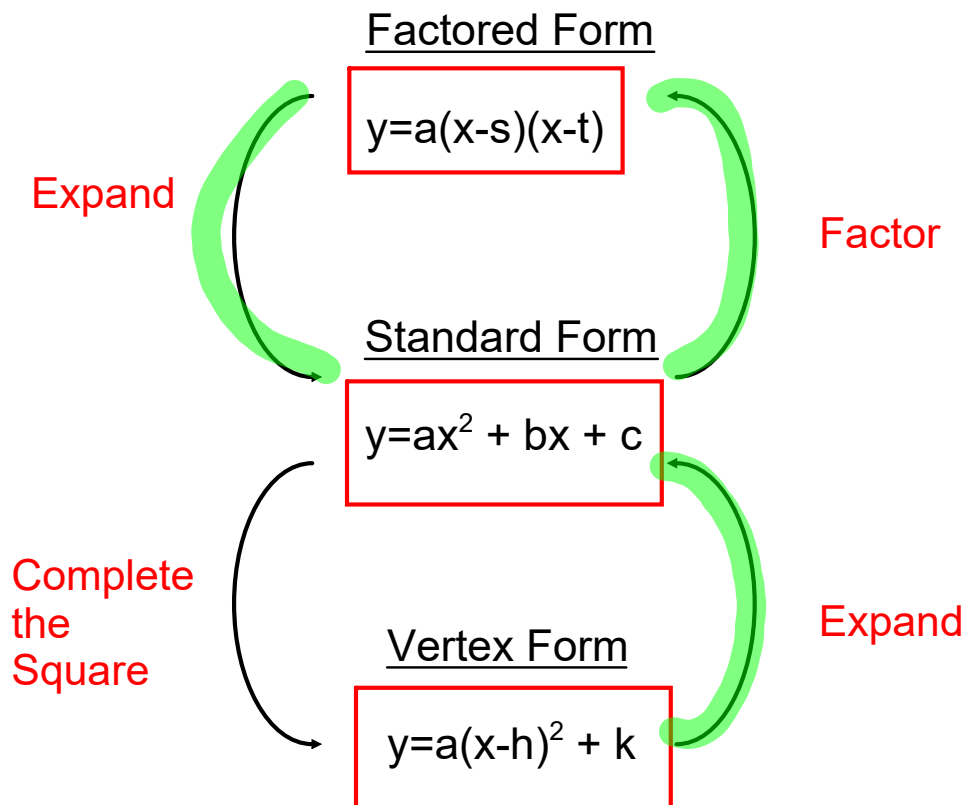
$$y = -(x + 4)^2 + 7$$

$$y = 0.8(x + 5)^2 - 3$$

$$y = 10x^2 - 15$$

Oct 28-8:54 PM

Connecting the Three Forms of a Quadratic



Oct 28-8:34 PM

Are we refreshed...?

Oct 14-9:39 PM

Write the following in Standard Form

$$y = -3(x - 4)^2 + 24$$

Verify your answer using a graphing calculator.

Oct 28-8:49 PM

Write the following in Factored Form

$$y = \frac{1}{2}(x + 1)^2 - 4.5$$

Verify your answer using a graphing calculator.

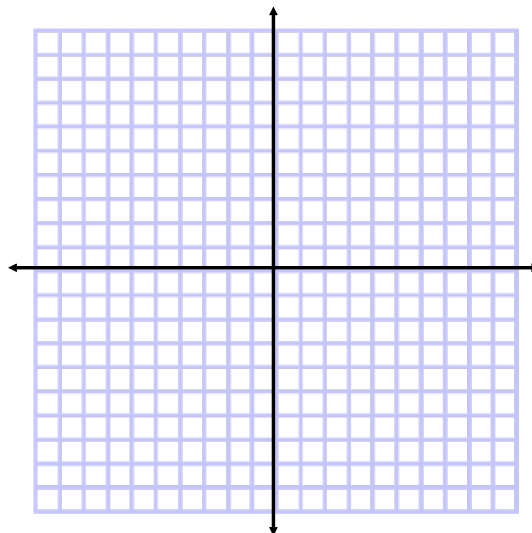
Oct 28-8:49 PM

Find the following for the given quadratic function:

- (i) x intercepts (zeros)
- (ii) y intercept
- (iii) axis of symmetry
- (iv) vertex
- (v) opens upward or downward

$$y = (x + 3)(x - 1)$$

Use the information to graph the quadratic.



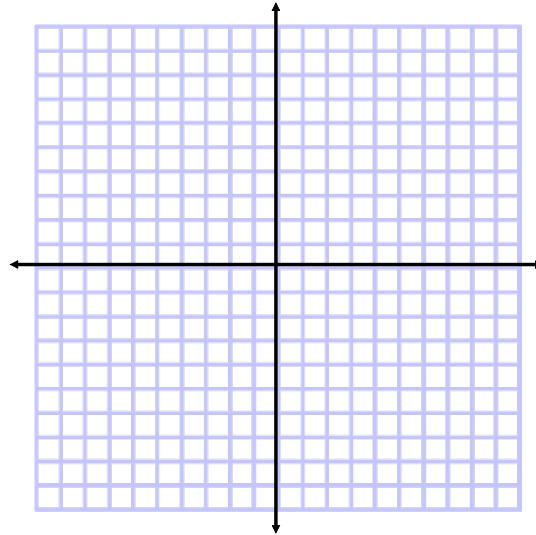
Oct 8-3:35 PM

Find the following for the given quadratic function:

- (i) x intercepts (zeros)
- (ii) y intercept
- (iii) axis of symmetry
- (iv) vertex
- (v) opens upward or downward

$$y = 2x^2 - 8x - 10$$

Use the information to graph the quadratic.



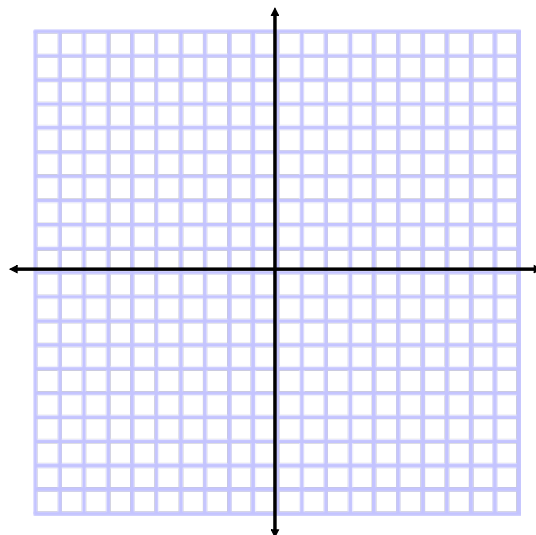
Oct 8-3:35 PM

Find the following for the given quadratic function:

- (i) x intercepts (zeros)
- (ii) y intercept
- (iii) axis of symmetry
- (iv) vertex
- (v) opens upward or downward

$$y = -3x^2 + 12$$

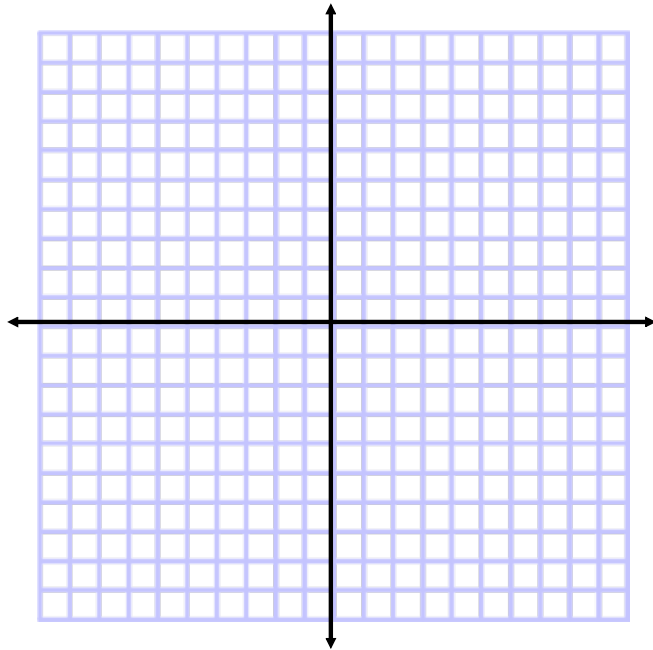
Use the information to graph the quadratic.



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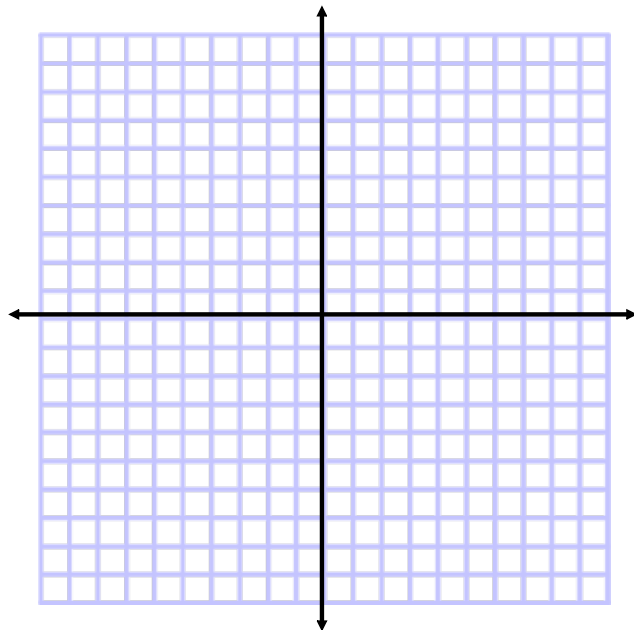
$$y = mx + b$$

Find the equation of the linear relationship that passes through A(3,1) and has a slope of -2.



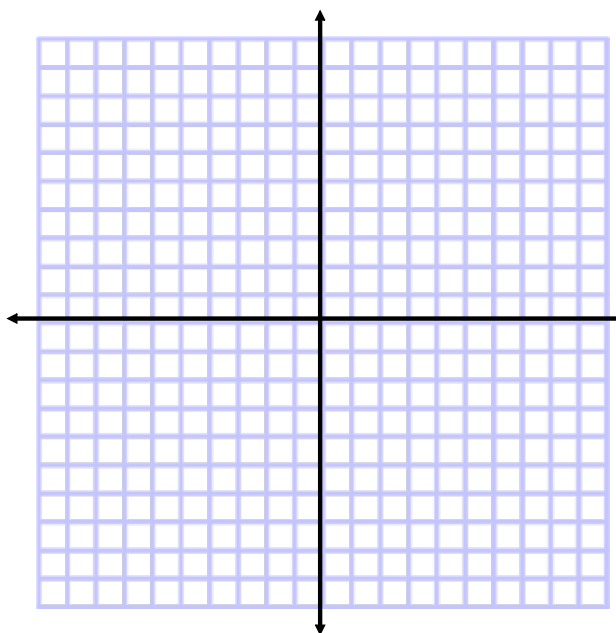
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Find the equation of the quadratic that has x intercepts of (-3,0) and (-1,0) and passes through A(0,6).



Oct 8-4:00 PM

Find the equation of the quadratic that has a vertex of $(-3,8)$ and passes through $A(-5,-4)$.



Oct 8-4:00 PM

Write the equation of the quadratic relationship that has a vertex of $(1,5)$ and passes through $(3, 13)$.

Oct 28-8:52 PM

Consolidation Questions:

Pg 145 #1-5, 11, 15

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