Section 3.2 - Finding Max and Min Values

Learning Goal: By the end of today, we will be able to determine the maximum or minimum values using

(i) a factored form approach
(ii) a vertex form approach (completing the square)

May 8-8:05 PM

Factored Form Approach

Oct 14-9:55 PM

Solve the following linear equations:

(a) $5x + 15 = 0$

(b) $7x - 4 = -3x + 26$

(c) $5(a + 1) = 0$

May 8-8:06 PM

For the following, what can you say for certain about each equation.

(i) $(5)(a) = 0$

(ii) $(-9)(b) = 0$

(iii) $(4)(a)(b) = 0$

(iv) $(a)(b)(c) = 0$

(vi) $(4)(a+1) = 0$

(vii) $(9)(x - 8) = 0$

Mar 25-9:13 PM

BIG IDEA

When two or more variables are multiplied together for a product of ZERO, at least one of the unknowns must be a zero.

$$a \cdot b = 0$$

Case 1

a = 0 and "b" is a number

Case 2

b = 0 and "a" is a number

Oct 8-4:47 PM

Solve the following:

$$(x+1)(x-5)=0$$

This is asking, when does the graph f(x) have y values equal to zero.

$f(x) = (x+1)(x-5)$

Oct 8-4:50 PM

Solving for a Product of ZERO, in Factored form

Solve for the given unknowns:

(a) $(x)(x+1) = 0$

(b) $(x - 3)(x + 7) = 0$

(c) $(2x - 1)(3x + 5) = 0$

(d) $(x + 5)(x - 7)(x - 12) = 0$

May 8-8:08 PM

Solving for a Product of ZERO, NOT in factored form

Solve for the given unknowns:

(a) $x^2 - 8x = 0$

(b) $x^2 + 7x + 12 = 0$

(c) $2x^2 - 13x + 15 = 0$

(d) $x^2 - 9 = 0$

May 8-8:08 PM

Solving for a Quadratic - Mixed Types

Solve for the given unknowns:

(a) $x^2 = 12x$

(b) $x^2 + 8x = -12$

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

(d) $3x^2 = 27$

May 8-8:08 PM

Success Criteria

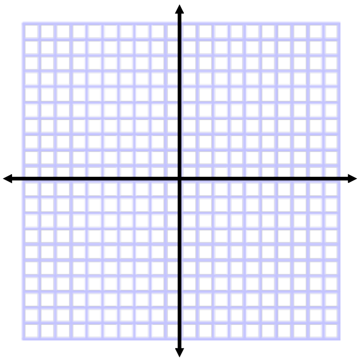
- collect all terms to one side, leave a Zero on the other side
- put in factored form to take advantage of the following concept
- (a)(b) = 0 , "a" or "b" must be zero, find the value that will make each bracket equal Zero

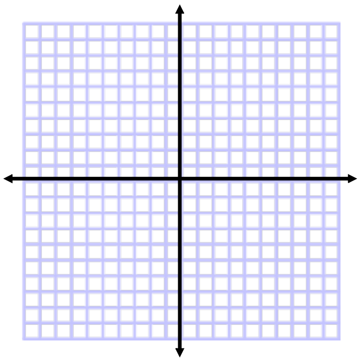
Oct 8-4:53 PM

Factored Form Approach

Find the Zeros:

1/ $y = 2(x-1)(x+4)$ 2/ $y = -2(x+7)(x-3)$





Recall: The axis of symmetry is the average of any two x-values that have the same y-values, so the average of the zeros is the axis of symmetry, and the x-value of the vertex.

Now that we have the x-value of the vertex how can we find the y-value?

Mar 22-9:59 AM

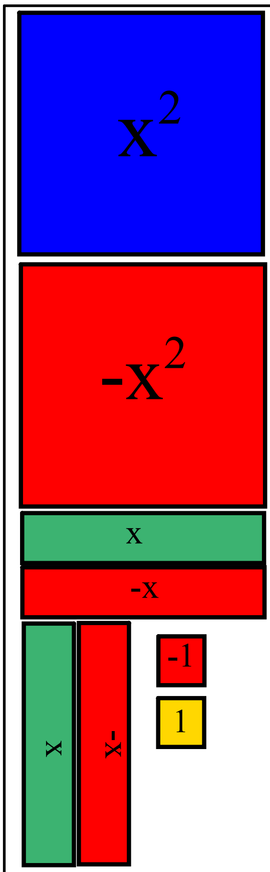
Factored Form Approach

1. Find the x intercepts
2. Find the axis of symmetry
3. Find the vertex
4. Use the "a" value to determine max or min

Oct 14-9:59 PM

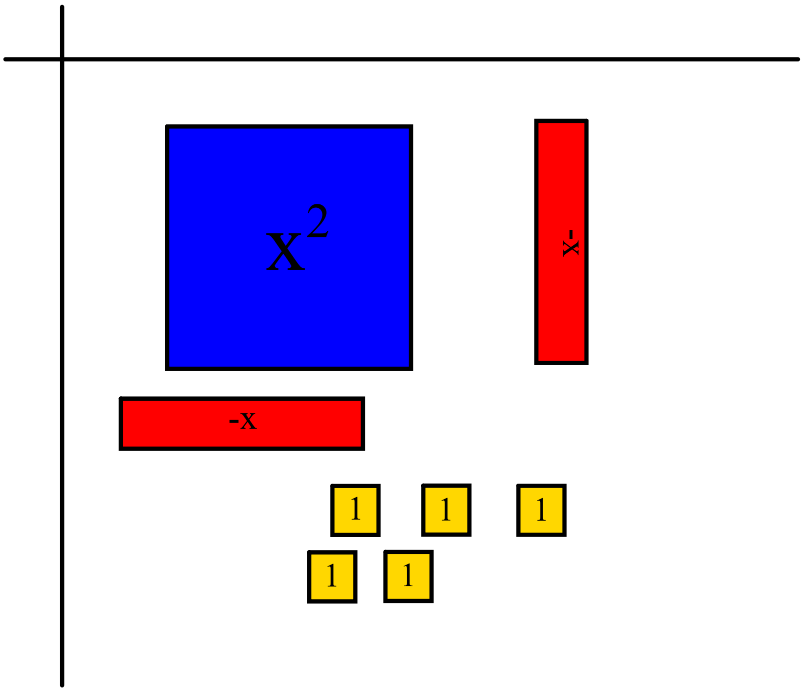
Completing the Square

Oct 14-10:06 PM



Using the given tiles, create a "square" and state the dimensions of the square as well as any leftover terms. Zero pairs are available if necessary.

$$x^2 - 2x + 5$$



Feb 12-11:53 AM

To complete the square we only need to work with the **ax^2 + bx** terms.
Guidelines

1. a = 1 before you start, this can be accomplished by factoring

2. find half of the b term and then square it

3. add and subtract that value to the expression, writing the positive term first

4. the first three terms should make up a perfect square trinomial, and can be rewritten with brackets squared

Example $x^2 - 2x + 5$

May 9-11:57 AM

Small Tweak Coming - Be Careful

Oct 28-8:04 PM

To complete the square we only need to work with the **ax^2 + bx** terms.

Guidelines

1. a = 1 before you start, this can be accomplished by factoring

2. find half of the b term and then square it

3. add and subtract that value to the expression, writing the positive term first

4. the first three terms should make up a perfect square trinomial, and can be rewritten with brackets squared

5. The term left inside the brackets is affected by the multiplying number out front

6. Apply the multiplier with Distributive property and collect like terms. Done!

Example $2x^2 + 16x$

May 9-11:57 AM

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Example $2x^2 + 12x + 7$

May 9-11:57 AM

Where might this technique be useful?

Example

Write the following in vertex form.

$$y = x^2 + 6x + 3$$

May 9-12:34 PM

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May 8-8:05 PM

Consolidation Questions:

Pg. 153 #1,3,4,8,9

May 8-8:10 PM