



Factoring Polynomials

A step-by-step guide created by Makiyah Cormick

Goal

Teach students how to
correctly factor a polynomial

After reviewing this presentation
students will be able to factor with
ease!

Factoring

Step 1

Factor out the GCF

- Find greatest value that each term can be divided by.

Step 2

Factor what's left

- Factor what you have left after finding your GCF.
- Remember to find the factors of your C term that also add up to be your B term.

Step 3

Check your answer

- Multiply your factors to see if you get the original polynomial
- If it's not the same as the original you did something wrong. Try again, don't give up.

Example 1

What is the factored form of $x^3 - 2x^2 - 15x$?

$$\begin{aligned}x^3 - 2x^2 - 15x &= x(x^2 - 2x - 15) \\ &= x(x - 5)(x + 3)\end{aligned}$$

Check $x(x - 5)(x + 3) = x(x^2 - 2x - 15)$
 $= x^3 - 2x^2 - 15x$ ✓

Factor out the GCF, x .

Factor $x^2 - 2x - 15$.

Multiply $(x - 5)(x + 3)$.

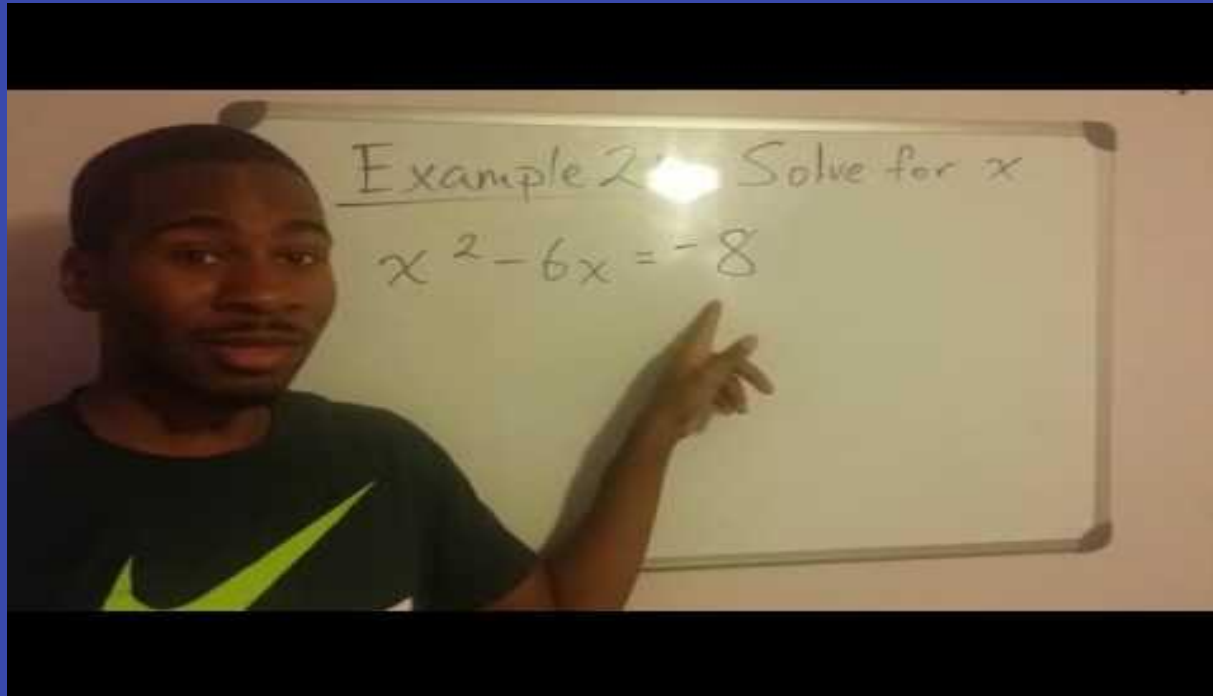
Distributive Property

Example 2

$$\begin{aligned} f(x) &= x^4 - 2x^3 - 8x^2 \\ &= x^2(x^2 - 2x - 8) && \text{Factor out the GCF, } x^2. \\ &= x^2(x + 2)(x - 4) && \text{Factor } (x^2 - 2x - 8). \end{aligned}$$

Repeat the same steps from the last example to factor this polynomial!

Extra Help (video)



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Your Turn!

Practice Problems

Factor the following...

7. $x^3 + 7x^2 + 10x$

8. $x^3 - 7x^2 - 18x$

9. $x^3 - 4x^2 - 21x$

Goal

Teach students how find zeros of a polynomial when given its factors.

After reviewing this presentation students will be able to find zeros of a polynomial in factored form.

Factoring

Step 1

Use Zero-Product Property

- Set each factor equal to 0.

Step 2

Solve the equation for x

- Do the opposite operation to get x by itself.

Step 3

Graph

- Each zero is where the graph crosses the x axis

Example



Problem 2 Finding Zeros of a Polynomial Function

What are the zeros of $y = (x + 2)(x - 1)(x - 3)$? Graph the function.

Know

Polynomial function

Need

- Zeros
- Additional points
- End behavior

Plan

- Use the Zero-Product Property to find zeros.
- Find points between the zeros.
- Sketch the graph.

Step 1 Use the Zero-Product Property to find the zeros.

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

so $x + 2 = 0$ or $x - 1 = 0$ or $x - 3 = 0$.

The zeros of the function are -2 , 1 , and 3 .

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

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Your Turn!

Practice Problems.



Lesson Check

Do you know HOW?

Find the zeros of each function.

1. $y = x(x - 6)$

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

3. $y = (x + 12)(x - 9)(x - 7)$

Goal

Teach students how to write a polynomial function from its zeros.

After reviewing this presentation students will be able to write a polynomial function when given its zeros.

Factoring

Step 1

Write a linear factor from each zero

- Subtract each zero from x
- $(x-\dots)(x-\dots)$

Step 2

Multiply

- Use FOIL or the box method to multiply the factor together

Step 3

Simplify the polynomial

- Combine Like Terms

Example Problem



Problem 3

Writing a Polynomial Function From Its Zeros

A What is a cubic polynomial function in standard form with zeros -2 , 2 , and 3 ?

$$\begin{array}{ccc} -2 & 2 & 3 \\ \downarrow & \downarrow & \downarrow \\ f(x) = (x + 2)(x - 2)(x - 3) \end{array}$$

$$= (x + 2)(x^2 - 5x + 6)$$

$$= x(x^2 - 5x + 6) + 2(x^2 - 5x + 6)$$

$$= x^3 - 5x^2 + 6x + 2x^2 - 10x + 12$$

$$= x^3 - 3x^2 - 4x + 12$$

-2 , 2 , and 3 are zeros.

Write a linear factor for each zero.

Multiply $(x-2)$ and $(x-3)$.

Distributive Property

Distributive Property

Simplify.

The cubic polynomial $f(x) = x^3 - 3x^2 - 4x + 12$ has zeros -2 , 2 , and 3 .

Video

Write a polynomial function from its zeros

Suppose the zeros of a polynomial are -4, 1, and 2

$$y = ?$$

$$y = (x + 4)(x - 1)(x - 2)$$

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Your Turn!

Write a polynomial function in standard form with the given zeros.

19. $x = 5, 6, 7$

23. $x = 1, -1, -2$

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THE END!