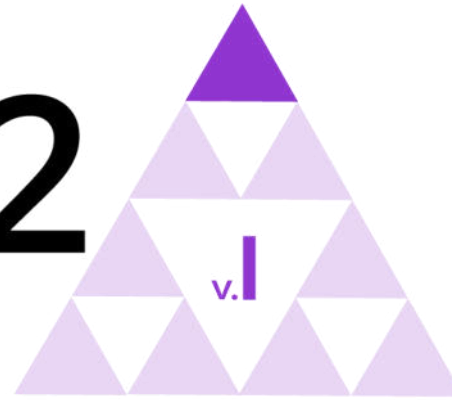


IM 9–12 MATH



Unit 2

Polynomials and Rational Functions

ALGEBRA 2

Lesson 24

Polynomial Identities (Part 2)

Learning Goal

Let's explore some other identities.

Algebra 2

Revisiting an Old Theorem



Warm-up

Instructions to make a right triangle:

- Choose two integers.
- Make one side length equal to the sum of the squares of the two integers.
- Make one side length equal to the difference of the squares of the two integers.
- Make one side length equal to twice the product of the two integers.

Follow these instructions to make a few different triangles. Do you think the instructions always produce a right triangle? Be prepared to explain your reasoning.



Here are the instructions to make a right triangle from earlier:

- Choose two integers.
 - Make one side length equal to the sum of the squares of the two integers.
 - Make one side length equal to the difference of the squares of the two integers.
 - Make one side length equal to twice the product of the two integers.
1. Using a and b for the two integers, write expressions for the three side lengths.
 2. Why do these instructions make a right triangle?

Identifying Identities



Here is a list of equations. Circle all the equations that are identities. Be prepared to explain your reasoning.

1. $a = -a$

2. $a^2 + 2ab + b^2 = (a + b)^2$

3. $a^2 - 2ab + b^2 = (a - b)^2$

4. $a^2 - b^2 = (a - b)(a - b)$

5. $(a + b)(a^2 - ab + b^2) = a^3 - b^3$

6. $(a - b)^3 = a^3 - b^3 - 3ab(a + b)$

7. $a^2(a - b)^4 - b^2(a - b)^4 = (a - b)^5(a + b)$

Egyptian Fractions



In Ancient Egypt, all non-unit fractions were represented as a sum of distinct unit fractions. For example, $\frac{2}{9}$ would have been written as $\frac{1}{3} + \frac{1}{9}$ (and not as $\frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9}$ or any other form with the same unit fraction used more than once). Let's look at some different ways we can rewrite $\frac{2}{15}$ as the sum of distinct unit fractions.

1. Use the formula $\frac{2}{d} = \frac{1}{d} + \frac{1}{2d} + \frac{1}{3d} + \frac{1}{6d}$ to rewrite the fraction $\frac{2}{15}$, then show that this formula is an identity.

2. Another way to rewrite fractions of the form $\frac{2}{d}$ is given by the identity $\frac{2}{d} = \frac{1}{d} + \frac{1}{d+1} + \frac{1}{d(d+1)}$. Use it to re-write the fraction $\frac{2}{15}$, then show that it is an identity.



Look back at the different identities you have investigated so far. Pick one that you have found interesting and write a few sentences explaining why.

I can justify why identities are true.

**Learning
Targets**

**Algebra
2**



Is $(a + b)(a^2 - ab + b^2) = a^3 + b^3$ an identity? Explain or show your reasoning.



identity

An equation which is true for all values of the variables in it.



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