2.5 - Exponent Laws Pt. II

October 2, 2019 8:48 AM

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2.5: Exponent Laws Part II

Exponent Law 3: Powers of Powers

Sometimes you will see a power raised to another power.

I know, right?

Don't worry, there's an exponent law for that, and it's pretty easy. If you see a power raised to another power, you just multiply the exponents together:

$$(a^m)^n = a^{m \times n}$$

Example 1: Simplify (write as 1 power) first without exponent laws, then use an exponent law

a) $(3^2)^4$

$= 3^2 \cdot 3^2 \cdot 3^2 \cdot 3^2$

$= 3^{2+2+2+2}$

$= 3^8$

$(3^2)^4 = 3^{2 \times 4}$

$= 3^8$

b) $(-2^2)^3$

$= (-2^2)(-2^2)(-2^2)$

$= -2^{2+2+2} = -2^6$

$(-2^2)^3 = -2^{2 \times 3}$

$= -2^6$

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Example 2: Simplify

a) $(5^2)^{10}$

$= 5^{2\times10}$

$= 5^{20}$

b) $[\left(\frac{1}{2}\right)^2]^4$

$= \left(\frac{1}{2}\right)^{2\times4} = \left(\frac{1}{2}\right)^8$

Exponent Law 4: Power of a Product

If a power's base consists of two numbers being multiplied together, you can distribute the exponent to both numbers:

$$(ab)^m = a^m b^m$$

Example 3: Calculate first without exponent laws, then use an exponent law

a) $(5 \times 4)^2$

$= 5^2 \times 4^2$

$= 25 \times 16$

$= 400$

b) $((-4) \times 5)^3$

$= (-4)^3 \times 5^3$

$= -64 \times 125$

$= -8000$

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Exponent Law 5: Power of a Quotient

If a power's base consists of two numbers being divided, you can distribute the exponent to both numbers:

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

Example 4: Calculate first without exponent laws, then use an exponent law

a) $\left(\frac{1}{2}\right)^2$

$= \frac{1^2}{2^2} = \frac{1}{4}$

b) $\left(\frac{4}{3}\right)^3$

$= \frac{4^3}{3^3} = \frac{64}{27}$

Textbook Assignment: Pg. 84 # 4-8, 14aceg