July 13, 2015

• Additive Identity

$a + 0 = a$ (0: additive identity)

* Recall: Additive Inverse

$a + (-a) = 0$ (0: identity)

$x + 2 = 4$

$0 - 2 \quad -2$

$x + 0 = 2$

$x = 2$

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• Multiplicative Identity

$a \cdot 1 = a$ (1: multiplicative identity)

Recall: Multiplicative Inverse

$\frac{a}{1} \cdot \frac{1}{a} = 1$ (1: identity)

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What Tools are being Used?

① $(2 + y) - 6 = 10$ assoc.

② $y - 4 = 10$ Comm & assoc.

③ $y = 14$ A. I.

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$(2 + y) - 6 = 10$

$(y + 2) - 6 = 10$ Comm

$y + (2 - 6) = 10$ assoc.

$y - 4 = 10$ Combine (add)

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① $3(x - 5) + 2 = 4x + 6$

② $3x - 15 + 2 = 4x + 6$ Dist.

③ $3x - 13 = 4x + 6$ assoc.

④ $-19 = x$ A. I.

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6.5 - Exponents & Scientific Notation

Def: a^n (n: exponent, a: base) where a is any real number and "n" is a natural number called an exponent.

Such that $a^n = \underbrace{a \cdot a \cdot \ldots \cdot a}_{n \text{ products of } a}$

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e.g. $5^3 = 5 \cdot 5 \cdot 5$ (3 ← exponent; 5 ← Base; 3 factors of 5 whose Product is 125)

$2^0 = 1$
$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$
$2^6 = 64$

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Examples

$3^2 = 3 \cdot 3 = 9$

* Be Careful
$-4^2 = (-1) \cdot 4^2 = (-1) \cdot 4 \cdot 4 = (-4) \cdot 4 = -16$ (base)
$(-4)^2 = (-4) \cdot (-4) = 16$ (base)

$0^8 = 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 = 0$

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Rules for Exponents

① Product Rule

* Multiplication

$x^2 \cdot x^3 = \underbrace{x \cdot x}_{x^2} \cdot \underbrace{x \cdot x \cdot x}_{x^3} = x^5$ (expanded; bases; same bases!)

* If we have some bases, then "add" exponents.

$x^{2+3=5} = x^5$

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$x^4 \cdot x^6 \cdot x^{\text{"assume a one"}} = x^{4+6+1=11} = x^{11}$

$6' = 6$

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② Power Rule

* multiplication

$(x^2)^3 = (x^2) \cdot (x^2) \cdot (x^2)$ (3 ← exponent; Base; same bases)

$= x \cdot x \cdot x \cdot x \cdot x \cdot x$
$= x^6$

* If we have some base multiply exponents

$(x^2)^3 = x^{2 \cdot 3 = 6} = x^6$

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3a Quotient Rule

same bases $\frac{x^3}{x^2} = \frac{x \cdot x \cdot x}{x \cdot x \cdot 1} = \frac{x}{1} = x$

* If we have some bases, subtract denominator exponent from numerator exponent.

$\frac{x^3}{x^2} = x^{3-2=1} = x^1 = x$

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3.6 Negative Exponent Rule

$$\frac{x^2}{x^3} = \frac{\cancel{x}\cdot\cancel{x}\cdot 1}{\cancel{x}\cdot\cancel{x}\cdot x} = \boxed{\frac{1}{x}}$$

* Using the Quotient Rule, then

$$\frac{x^2}{x^3} = x^{2-3=-1}$$

$$= x^{-1} \leftarrow \text{Negative Exponent}$$

$$= \frac{1}{x^1}$$

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

$$a^{-m} = \frac{1}{a^m}$$

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2, 3, 6, 10, 11, 13, 15, 17, 19, 21, 23, 25, 27, 28, 29, 31, 33, 35, 37, 39, 45, 47, 49, 51, 53, 59, 63

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