

Sec. 7.6 - Polynomials and Factoring

HW #5, 18, 19, 39*, 43*, 45*, 46, [47-99 e.o.o.], 100

* Also use the CFQ and Tic-Tac-Toe Methods on these

Agenda:

1. Wrap up 7.5 from last time.
2. Begin 7.6 - Polynomials
3. Get out and vote!



Looking ahead: Next quiz will be Tuesday 11/11.

Nov 4-8:02 AM

Last time: Why do the "rules" work?

4. $a^n a^m = a^{n+m}$

5. $\frac{a^n}{a^m} = a^{n-m}$ $\frac{2^3}{2^4} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 2} = 2^{-1}$

2. $a^{-n} = \frac{1}{a^n}$ $\frac{a^{-n}}{1} \cdot \frac{a^n}{a^n} = \frac{a^0}{a^n} = \frac{1}{a^n}$

6. $(a^n)^m = a^{nm}$ $(2^3)(2^3)(2^3)(2^3) = 2^{3+3+3+3} = 2^{3 \cdot 4}$

7. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ $\left(\frac{a}{b}\right)\left(\frac{a}{b}\right)\left(\frac{a}{b}\right) = \frac{a \cdot a \cdot a}{b \cdot b \cdot b} = \frac{a^3}{b^3}$
 $\left(\frac{a}{1} \cdot \frac{1}{b}\right)^n = \left(\frac{a}{1}\right)^n \left(\frac{1}{b}\right)^n$

Nov 3-9:09 AM

Scientific Notation:

A number is written in scientific notation if it is expressed in the following form, where $1 \leq |a| < 10$ and n is an integer:

$$a \times 10^n$$



1. Write these in scientific notation:

A) $820,000,000,000 = 8.2 \times 10^{11}$

B) $0.00072 = 7.2 \times 10^{-4}$

C) $12,000,000 \times 0.00009$

$$1.2 \times 10^7 \times 9 \times 10^{-5} = (1.2)(9) \times (10^7 \cdot 10^{-5})$$
$$= 10.8 \times 10^2 = 1.08 \times 10^3$$

2. Write in standard notation:

A) $4.5 \times 10^{-9} = 0.000000045$

B) $1.92 \times 10^{12} = 1,920,000,000,000$

Nov 3-9:17 AM

More Practice:

3. Calculate, using scientific notation.

$$\frac{126,000 \times 20,000}{45,000,000,000} = \frac{1.26 \times 10^5 \times 2 \times 10^4}{4.5 \times 10^{10}}$$
$$= \left(\frac{1.26 \times 2}{4.5}\right) \times \left(\frac{10^5 \times 10^4}{10^{10}}\right) = .56 \times 10^{-1} = .056$$



U.S. NATIONAL DEBT CLOCK

The Outstanding Public Debt as of 03 Nov 2008 at 03:27:34 PM GMT is:

\$10,545,158,964,879.02 $\approx 1.05 \times 10^{13}$

The estimated population of the United States is 305,026,941

$\approx 3.1 \times 10^8$

On average, approximately how much does each man, woman, and child owe towards the national debt? (Use scientific notation to answer this question.)



Nov 3-9:22 AM

7.6 - Polynomials and Factoring

What is a polynomial?

Examples:

$(2x+1)(x-5)$ ← deg. 2

$5x^3 + 3x^2 + 2x + 1$ ← deg. 3

binomial $x^2 + 1$ ← deg. 2

trinomial $x^2 + 2x + 1$

$y^2 + 3y - 2$

$2x + x^2 - 1$ ← not descending powers

$2x + 1$

term monomial

polynomial in x

Non-Examples:

$x^2 + y$ (maybe)

$\frac{x^2 + 1}{x}$

degree of polynomial

descending powers

Nov 4-8:26 AM

Addition and Subtraction of Polynomials:

$$-3n^3 + 2n - 5 - (6 - n) + 4n^3$$

$n^3 + 3n - 11$

$-3n^3 + 4n^3 \leftarrow \text{distributive property}$

$= n^3(-3+4) = n^3(1) = n^3$

Multiplication of Polynomials:

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

$$= 2x^2 + 6x + x + 3 = 2x^2 + 7x + 3$$

F.O.I.L.:

$$(x+3)(2x+1)$$

$$2x^2 + x + 6x + 3$$

F O I L

Area model:

	$2x$	1	
x	$2x^2$	x	⊕
3	$6x$	3	

Vertical arrangement:

$$\begin{array}{r} x+3 \\ 2x+1 \\ \hline x+3 \\ + 2x^2+6x \\ \hline 2x^2+7x+3 \end{array}$$

Nov 4-9:00 AM

Factoring Polynomials:

Greatest Common Factor:

Ex: $6x^2y^3 - 2xy^4$

$$= \underbrace{2xy^3}_{\text{GCF of}} (3x - y)$$

Factoring Trinomials:

A) $x^2 + 7x + 10$
 $(x + 5)(x + 2)$

B) $x^2 - x - 12$
 $(x - 4)(x + 3)$

$$\begin{aligned} -12 &= -3 \cdot 4 \\ &= -2 \cdot 6 \\ &= -1 \cdot 12 \\ &= -12(1) \\ &= (-6)(2) \\ &= (-4)(3) \end{aligned}$$

C) $x^2 - 49$
 $(x + 7)(x - 7)$

Nov 4-9:02 AM

Questions to Consider:

1. Does $x^2 + 7x - 12$ factor? Why or why not?

No: none of the pairs of factors of -12 sum to 7.

$$\begin{array}{ll} (-1)(12) & (12)(1) \\ (-2)(6) & (-6)(2) \\ (-3)(4) & (-4)(3) \end{array}$$

2. Given $x^2 + bx - 12$, what can we replace b by so the trinomial factors with integer coefficients?

$$b \in \{11, 4, 1, -1, -4, -11\}$$

Nov 4-9:07 AM