Precalculus

Write your questions and thoughts here!

5.1 Operations on Polynomials Name:_____

Polynomials:

A polynomial is one or more monomials put together by addition or subtraction. Here's an example of a polynomial:

$$f(x) = -2x^3 + 8x - 3x^5 + 1$$

Each exponent must be a whole number The coefficients must be real number.

1 ← **Constant Term:** The only term without a variable. (It's a constant!)

5 ← **Degree:** The largest exponent of the variable.

-3 ← **Leading Coefficient:** The coefficient of the "degree" term.

Standard Form: The "degree" term is written first and each successive term's exponent decreases. $f(x) = -3x^5 - 2x^3 + 8x + 1$

Add, Subtract, and Multiply Polynomials:

1. $(6a^3 + 5a) + (a + 6a^3 - 2)$

$= 12a^3 + 6a - 2$

2. $(4x^4 + 2) - (7x^2 + x^4 - 7)$

$= 3x^4 - 7x^2 + 9$

3. $(7n + 1)(n^2 + 6n + 3)$

$= 7n^3 + 42n^2 + 21n + n^2 + 6n + 3$

$= 7n^3 + 43n^3 + 27n + 3$

The types of factoring we will review today:

1. Difference of Squares
2. Factor by Grouping
3. Quadratics (with Lead. Coef.)
4. Quadratic Form

Difference of Squares:

$a^2 - b^2 = (a-b)(a+b)$ conjugates

FACTOR

4. $t^5 - 16t = t(t^4 - 16)$

$= t(t^2 - 4)(t^2 + 4)$

$= t(t-2)(t+2)(t^2+4)$

5. $81x^2 - 100y^8 = (9x - 10y^4)(9x + 10y^4)$

Factor by Grouping:

GCF $= 3d^2$

6. $(56v^3 - 49v^2) + (48v - 42)$

$= 7v^2(8v - 7) + 6(8v - 7)$

$= (8v - 7)(7v^2 + 6)$

7. $42a^2d^2c + 147a^2d^3 - 36xd^2c - 126xd^3$

$= 3d^2[(14a^2c + 49a^2d) + (-12xc - 42xd)]$

$= 3d^2[7a^2(2c + 7d) + -6x(2x + 7d)]$

$= 3d^2(2c + 7d)(7a^2 - 6x)$

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5.1 Operations on Polynomials

Quadratic: ax^2+bx+c

8. $9r^2 - 66r + 105$

GCF = 3

$= 3[3r^2 - 22r + 35]$

$= 3[(3r^2 - 7r) + (-15r + 35)]$

$= 3[r(3r-7) + -5(3r-7)]$

$= 3(3r-7)(r-5)$

mult $135r^2$ | Add $-22r$

$Y_1 = 105/X$ | X | Y_1

Quadratic Form:

9. $-3x^4 + 24x^2 + 27$ GCF = -3

$= -3[x^4 - 8x^2 - 9]$

$= -3(x^2 - 9)(x^2 + 1)$

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

10. $a^4 - 2a^2b^2 - 15b^4$

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

Zero Product Property:

$$ab = 0$$

$a = 0$ or $b = 0$

Example: $3x(2x-8)(4x+5) = 0$

$3x = 0$, $x = 0$ | $2x - 8 = 0$, $2x = 8$, $x = 4$ | $4x + 5 = 0$, $4x = -5$, $x = -5/4$

Find ALL Solutions by Factoring: (if possible)

11. $x^5 - x^4 + 3x^3 - 3x^2 = 0$

$x^2[(x^3 - x^2) + (3x - 3)] = 0$

$x^2[x^2(x-1) + 3(x-1)] = 0$

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

$x^2 = 0$, $x = 0$ | $x - 1 = 0$, $x = 1$ | $x^2 + 3 = 0$, $x^2 = -3$, $x = \pm\sqrt{-3}$, $x = \pm i\sqrt{3}$

12. $5x^3 + 6x = 7x^2$

$5x^3 - 7x^2 + 6x = 0$

$x(5x^2 - 7x + 6) = 0$

$x = 0$ | Prime: $5x^2 - 7x + 6 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-(-7) \pm \sqrt{(-7)^2 - 4(5)(6)}}{2(5)}$

$= \frac{7 \pm \sqrt{49 - 120}}{10}$

$= \frac{7 \pm \sqrt{-71}}{10}$

$x = \frac{7 \pm i\sqrt{71}}{10}$

Now summarize what you learned!