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 ________________. The coefficients must be __________________.

Constant Term: The only term without a variable. (It's a constant!)
Degree: The largest exponent of the variable.
Leading Coefficient: The coefficient of the "degree" term.
Standard Form: The "degree" term is written first and each successive term's exponent decreases.

Add, Subtract, and Multiply Polynomials:

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

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

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

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:

4. $t^5 - 16t$

5. $81x^2 - 100y^8$

Factor by Grouping:

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

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

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Quadratic:

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

Quadratic Form:

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

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

Zero Product Property:

$$ab = 0$$

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

Find ALL Solutions by Factoring: (if possible)

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

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

Now summarize what you learned!

5.1 Practice – Operations on Polynomials Name: ___________________________

Pre-Calculus

Name the degree and leading coefficient.

1. $5a^2 - 2a^3 - 5a - 2a^5 - 5a^4$ Degree: _____ Leading Coefficient: _____	2. $8k^2 - 2 + k + 9k^3$ Degree: _____ Leading Coefficient: _____	3. $6x^4 + x^5 - 9x^3 + 4$ Degree: _____ Leading Coefficient: _____

Simplify each expression.

4. $(7p^3 + 3p^2) - (p - 5p^3 - 2p^2)$

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

6. $(2v^2 - 3v^4 + 4) + (1 - 2v^4 - 5v^2)$

7. $(3 + 4x^4) - (7x^4 + 3x^2 + 1) + (4x^4 + 3)$

8. $(8m + 6)(m^2 - 6m - 8)$

9. $(5u^2 - 7v^2)(5u^2 + 7v^2)$

10. $(8x - 5y^3)^2$

11. $(6n^2 - 8n - 3)(8n - 6)$

Factor each completely.

12. $7x^4 + 11x^3 - 30x^2$

13. $5x^2 - 9x - 18$

14. $-9p^4 - 42p^3 + 72p^2$

15. $9x^2 - 16$

16. $x^2 + 16$

17. $125w^2 - 80$

18. $5x^4 + 30x^2 - 200$

19. $-x^4 + 3x^2 - 2$

20. $30u^6 + 6u^3 - 108$

21. $42n^3 + 48n^2 - 49n - 56$

22. $12xy - 16x^2 + 21y - 28x$

23. $7k + 5k^3 - 35k^2 - 49$

Solve each equation using your new factoring abilities! Find ALL the solutions. *Hint: don't forget to use the quadratic formula if a quadratic expression does not factor.*

24. $x^3 + 2x^2 = -10x$

25. $x^3 = 6x^2 + x$

26. $x^6 - 5x^4 = x^2 - 5$

27. $x^4 + 6x^2 = 27$

28. $x^5 - x = 0$

29. $x^3 + 4x^2 + 3x = 0$

Skillz Review: Find the x- and y-intercepts for each function. SHOW ALL WORK!

1. $-3x + y = -7$

x-int: y-int:

2. $f(x) = \frac{x^2+2x}{2x^2-2x-4}$

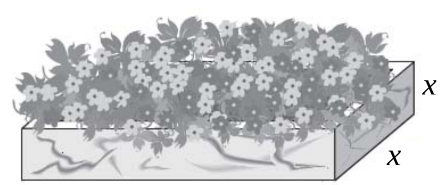
x-int: y-int:

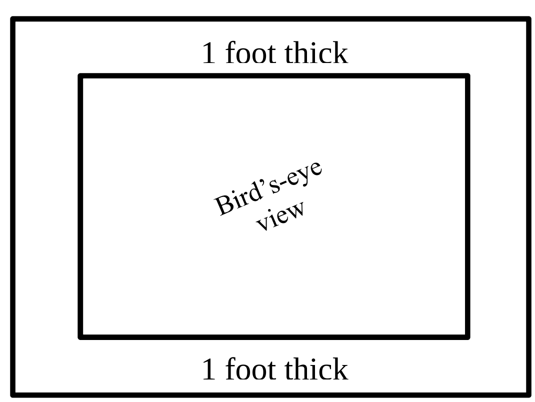
5.1 Application and Extension

1. Factor: $21x^8 - 117x^4 - 210$

2. Find ALL solutions: $x^3 - 5x^2 + 4x - 20 = 0$

3. You are designing several marble planters for a city park. You want the length of the planter to be 1 foot longer than the width, and the height to be the same as the width (the picture is not to scale). The sides should be one foot thick. Because the planter will be on the sidewalk, it does not need a bottom. What should the outer dimensions of the planter be if it is to hold 6 cubic feet of dirt? (Solve using methods of factoring).





4. A rectangular sheet of material can be used to form an open box by cutting out square inches from all four corners and then folding up the sides. Each square that is removed has a width x. The possible volume of this box is given by $V(x) = x^3 - 51x^2 + 630x$.
   a. Draw the sheet of material with the cut out corners.

   b. Factor the equation, and use the factors along with the graph (on a calculator) to determine the relevant domain for this scenario. (x is measured in inches). In other words, what is the smallest and largest the cutout squares can be?

   c. How large should the cut out be to give the box the largest possible volume? (Use the graphing calculator to find this.)