Algebra 2H
6.3 Add, Subtract, and Multiply Polynomials
6.4 Factoring and Solving Polynomial Equations
Goal: Add, subtract, and multiply polynomials. Factor and solve polynomial expressions.

HW - Section 6.3 #22-25, 29, 38, 44, 50
Section 6.4 39, 40, 46, 47, 55, 56, 77-82
Quiz 6.1-6.4 Thursday (end of class)

Section 6.3
Adding and Subtracting Polynomials

- Add and subtract like terms (same variable, same exponent)
- Remember to distribute subtraction to every term in the polynomial

Examples:

1. $(15m^3+8m)+(2m^2-6m+9)$

$15m^3+2m^2+2m+9$

2. $(4z^2+3)-(z^3-5z+4z^2)$

$-z^3+5z+3$

$(b^4+10b)-(4b^3+6b^2-b+5)$

3. $b^4 \quad +10b$
$-(\quad 4b^3+6b^2-b+5)$

$b^4-4b^3-6b^2+11b-5$

4. $(\sqrt{2}d^2-6d+1)+(2\sqrt{2}d^2+d-8)$

$3\sqrt{2}d^2-5d-7$

Multiplying Polynomials

- When multiplying two terms with the same base, ADD exponents

Examples:

1. $8y^3(2y^4-5y)$

$16y^7-40y^4$

2. $(h-3)(h^2+2h-8)$

$h^3+2h^2-8h-3h^2-6h+24$

$h^3-h^2-14h+24$

3. $(4c^3+5)(4c^3-5)$

$16c^6-20c^3+20c^3-25$

$16c^6-25$

factor as a quadratic.

4. $(2c+3)^3 \rightarrow \neq 2^3c^3+3^3 \neq 8c^3+27$

$(2c+3)(2c+3)(2c+3)$

$(4c^2+6c+6c+9)$

$(4c^2+12c+9)(2c+3)$

$8c^3+12c^2+24c^2+36c+18c+27$

$8c^3+36c^2+54c+27$

If $f(x)=2x^2$ and $g(x)=x^3-5$, find:

A. $(f+g)(x)$ $f(x)+g(x)$

B. $(f-g)(x)$ $f(x)-g(x)$

C. $fg(x)$ $f(x)g(x)$

D. $f\,og(x)$ $f(g(x))$

E. $g(f(x))$ $g(f(x))$

A few more problems:

For 1 -4, simplify each expression. Assume all variables represent positive integers.

1. $3x^b(5x^{2b}+4x^{3b-1})$

2. $(6x^m-5)(2x^{2m}-3)$

3. Find the product $(a+b+c)^2$

4. Use your results from ~~#4~~ #3 to find: $(x^2+3x-2)^2$

Section 6.4 Factoring and Solving Polynomial Equations

Factoring

$25c^2 - 4$
$(5c+2)(5c-2)$

- Look for a common factor
- Two terms? Try factoring as a difference of squares or as a sum or difference of cubes
- Three terms? Try factoring as a square of a binomial or test the factors of the terms
- More than three terms? Try factoring by grouping → like a quadratic ex ($+c$)
- Factor completely. Make sure each factor is prime

Sum and Difference of Cubes

* $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ * $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Examples: Factor.

A. $27y^3 + 8$

$(3y)^3 + (2)^3$
$(3y+2)((3y)^2 - (3y)(2) + (2)^2)$
$(3y+2)(9y^2 - 6y + 4)$

B. $216d^3 - 125$

$(6d)^3 - (5)^3$
$(6d-5)(36d^2+30d+25)$
$((6d)^2 + (6d \cdot 5) + (5)^2)$

$2x^2y - 8y$

Factoring by Grouping – Check for a common binomial factor or for a difference of squares

Examples: Factor.

A. $2x^3 + 6x^2 - 8x - 24$

$2x^2(x+3) - 8(x+3)$ * the binomials have to be the same. if not :(
$(x+3)(2x^2 - 8)$
$2(x+3)(x^2-4)$
$2(x+3)(x+2)(x-2)$

B. $y^2 - 9a^2 + 12y + 36$

$y^2 + 12y - 9a^2 + 36$
$y(y+12) - 9(a^2-4)$
$y(y+12) - 9(a+2)(a-2)$

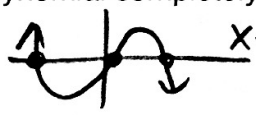
C. $d^6 - 26d^3 - 27$ factor this like a quadratic.

ex. $d^2 - 26d - 27$.
$(d-27)(d+1)$

$(d^3-27)(d^3+1)$
$(d^3-3^3)(d^3+1^3)$
$(a^3-b^3)(a^3+b^3)$
$(d-3)(d^2+3d+9)(d+1)(d^2-d+1)$
$(a-b)(a^2+ab+b^2)$

Solving by Factoring

Set the equation equal to zero. Factor the polynomial completely. The solutions are the values that make each factor equal to zero.



x-intercepts! find..

Examples: Solve by factoring

A. $y^2 + 2y - 63 = 0$

$(y+9)(y-7)=0$

$y=7,-9$

B. $2x^2 = 4x$

$2x^2-4x=0$

$2x(x-2)=0$

$x=0,2$

C. $x^3 + 4x^2 - 9x = 36$ grouping

$x^3+4x^2-9x-36=0$

$x^2(x+4)-9(x+4)=0$

$(x^2-9)(x+4)=0$

$(x+3)(x-3)(x+4)=0$

$x=\pm 3,-4$

D. $x^3 - 5x^2 - x + 5 = 0$

$x^2(x-5)-1(x-5)=0$

$(x^2-1)(x-5)=0$

$(x+1)(x-1)(x-5)=0$

$x=\pm 1, 5$

E. $50c^3 + 240c^2 - 50c = 0$

$10c(5c^2+24c-5)=0$

1, 5 5, -1

$10c(c+5)(5c-1)=0$

$c=0,-5,1/5$

F. $8x^4 + 10x^2 - 3 = 0$

2, 4 12 3, -1

-2

$2x^2=-3$

$x^2=-3/2$

$x=\pm i\frac{\sqrt{6}}{2}$

$(2x^2+3)(4x^2-1)=0$

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

$x=\pm 1/2, \pm i\frac{\sqrt{6}}{2}$

G. $k^6 - 4k^2 = 0$

$k^2(k^4-4)=0$

$k^2(k^2+2)(k^2-2)=0$

$k=0,\pm\sqrt{2},\pm i\sqrt{2}$

H. $4g^3 - g^2 - 4g = -1$

$4g^3-g^2-4g+1=0$

$g^2(4g-1)-1(4g-1)=0$

$(g^2-1)(4g-1)=0$

$(g+1)(g-1)(4g-1)=0$

$g=\pm 1, 1/4$

I. $10u^4 - 8u^3 + 25u^2 - 20u$

$2u^3(5u-4)+5u(5u-4)=0$

$(2u^3+5u)(5u-4)=0$

$u(2u^2+5)(5u-4)=0$

$u=4/5, 0, \pm i\frac{\sqrt{10}}{2}$

$2u^2+5=0$

$2u^2=-5$

$u^2=-5/2$