

Section P.5: Factoring Polynomials

- The process of breaking apart a polynomial....

backwards multiplying

Always look for a GCF first.

Example:

$$18x^3 + 27x^2$$

$$\text{GCF} : 9x^2$$

$$9x^2(2x + 3)$$

check with
distribution

$$x^2(x+3) + 5(x+3)$$

common factor

$$(x+3)(x^2+5)$$

- Factor by Grouping

- group terms together and factor out the GCF.

$$\begin{aligned} & (x^3 + 4x^2) + (3x + 12) \\ & x^2(x+4) + 3(x+4) \\ & (x+4)(x^2 + 3) \end{aligned}$$

not always
the 1st 2
& last 2

Factoring Trinomials:

$$ax^2 \pm bx \pm c$$

- When a is one, find factors of c that add or subtract to get b. Remember the signs tell you everything!!!!
- When a is not 1, use the rainbow method.

???

Signs		Factors
1 st	2 nd	
+	+	(+)(+)
-	+	(-)(-)
+	-	(+B)(-s)
-	-	(-B)(+s)

Big# Small#

Examples:

$$x^2 + 6x + 8$$

factors of 8
that add to 6

$$(x+4)(x+2)$$

$$x^2 + 3x - 18$$

diff
bigger +

$$(x+6)(x-3)$$

$$8x^2 - 10x - 3$$

$\frac{2}{4}$ $\frac{12}{2}$ $\frac{24}{2}$

$$(2x-3)(4x+1)$$

check with FOIL

Special Cases:

Need
to
know

Difference of Squares

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

Perfect Squares

$$a^2 + 2ab + b^2 = (a+b)^2$$

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

Sum/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:

$$x^2 - 4$$

$$x^2 - 2^2$$

$$(x+2)(x-2)$$

$$81x^2 - 49$$

$$(9x)^2 - 7^2$$

$$(9x+7)(9x-7)$$

$$x^4 - 81$$

$$(x^2)^2 - 9^2$$

$$(x^2+9)(x^2-9)$$

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

$$x^2 + 6x + 9$$

$$(x+3)(x+3)$$

$$(x+3)^2$$

$$25x^2 - 60x + 36$$

$$(5x)^2 - 2(6)(5x) + 6^2$$

$$(5x-6)^2$$

$$x^3 + 8$$

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

$$64x^3 - 125$$

$$(4x)^3 - 5^3$$

$$(4x-5)(16x^2+20x+25)$$

Steps to Factoring:

1st - GCF2nd - 2 terms - Special Cases3rd - 3 terms - Trinomial Factoring4th - 4+ terms - Grouping

Examples:

$$2x^3 + 8x^2 + 8x$$

$$2x(x^2 + 4x + 4)$$

$$2x(x+2)(x+2)$$

$$2x(x+2)^2$$

$$x^2 - 25a^2 + 8x + 16$$

$$x^2 + 8x + 16 - 25a^2$$

$$(x+4)^2 - (5a)^2$$

$$(x+4+5a)(x+4-5a)$$

Harder: $x(x+1)^{-3/4} + (x+1)^{1/4}$

$$x(x+1)^{-3/4} + (x+1)^{-3/4}(x+1)^{1/4} = (x+1)^{1/4}$$

$$(x+1)^{3/4}(x+x+1)$$

$$(x+1)^{3/4}(2x+1)$$

$$\frac{2x+1}{(x+1)^{3/4}}$$

Suggested Homework:

Chapter P.5 pg.53 #'s

5, 7, 15, 21, 23, 29, 33, 43, 45,

49, 53, 59, 63, 67, 75, 81, 99