Learning Target(s): I can completely factor a polynomial function using sum/difference of two cubes, difference of two squares, grouping, and/or trinomials methods.
I can find all real number solutions to polynomials functions after factoring.

5.4 Factor and Solve Polynomial Equations

prime polynomial: a polynomial with two or more terms that cannot be written as a product of polynomials of lesser degree using only integer coefficients and constants and the only common factors of its terms are -1 and 1

- No GCF
- Not factorable with integers
- No grouping

Ex. 1 Are the following prime polynomials?

a. $x^3 + 2x^2 - 15x$

GCF: x
No! → $x(x^2+2x-15)$

b. $5x^2(x^2 - 3)$

Yes! b/c no more factoring

factored completely: a polynomial is factored completely if it is written as a monomial or the product of a monomial and one or more prime polynomials

SPECIAL FACTORING PATTERNS: Must be memorized*

perfect square trinomial	difference of two squares	* sum of two cubes	* difference of two cubes
$a^2+2ab+b^2$	a^2-b^2	a^3+b^3	a^3-b^3
$(a+b)^2$	$(a+b)(a-b)$	$(a+b)(a^2-ab+b^2)$	$(a-b)(a^2+ab+b^2)$

Ex. 2 Factor the polynomial completely.

a. $z^3 - 125$ a: z b: 5

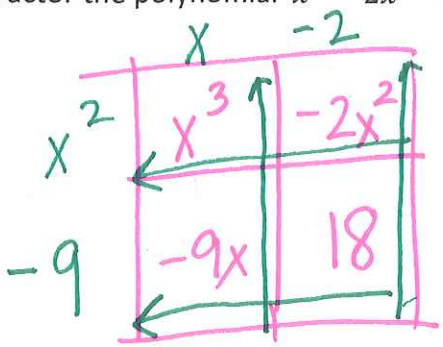
$(z-5)(z^2+5z+25)$

b. $81y^4 + 192y$ * GCF first * a: 3y b: 4

$3y(27y^3+64)$ $a^2:(3y)^2$ $b^2:4^2$

$3y(3y+4)(9y^2-12y+16)$

Ex. 3 Factor the polynomial $x^3 - 2x^2 - 9x + 18$ completely.



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

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

quadratic form: an expression of the form au^2+bu+c where u is any expression in x

Ex. 4 Factor completely. *GCF First*

a. $16x^4 - 256$

$16(x^4-16)$

$16(x^2+4)(x^2-4)$

$16(x^2+4)(x+2)(x-2)$

GCF first $3y^3$

b. $3y^7 - 15y^5 + 18y^3$

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

$3y^3(y^2-2)(y^2-3)$

Ex. 5 What are the real-number solutions of the equation $x^4 + 9 = 10x^2$? Set equal to 0

$-10x^2 \quad -10x^2$

$x^4 - 10x^2 + 9 = 0$

$(x^2-9)(x^2-1) = 0$

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

$x = -3$
$x = 3$
$x = -1$
$x = 1$

Try it!
Factor the following polynomials completely.

1. $8x^3 + 64$
2. $x^3 + 2x^2 - 25x - 50$
3. $x^4 - 14x^2 + 45$

Find the real-number solutions.

4. $2x^5 + 24x = 14x^3$