Day 3 Factor Polynomials

Objective: Factor polynomials and recognize factoring patterns, the sum of two cubes and the difference of two cubes.

Example 1: Factor each polynomial completely.

a. $x^3 - 4x^2 - 5x$ **b.** $3y^5 - 48y^3$ **c.** $5z^4 + 30z^3 + 45z^2$

$x(x^2-4x-5)$ $3y^3(y^2-16)$ $5z^2(z^2+6z+9)$

$x(x-5)(x+1)$ $3y^3(y-4)(y+4)$ $5z^2(z+3)(z+3)$

or

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

Core Concept

Special Factoring Patterns

Sum of Two Cubes

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

Example

$64x^3 + 1 = (4x)^3 + 1^3$

$= (4x + 1)(16x^2 - 4x + 1)$

Difference of Two Cubes

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

Example

$27x^3 - 8 = (3x)^3 - 2^3$

$= (3x - 2)(9x^2 + 6x + 4)$

Example 2: Factor the sum or difference of two cubes

(a) $x^3 - 125$ (b) $16s^5 + 54s^2$

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

5 0 AP

$2s^2(8s^3+27)$

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

5 0 AP

Example 3: Factor completely by grouping.

$z^3 + 5z^2 - 4z - 20$

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

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

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

Example 4: Factor completely

(a) $16x^4 - 81$

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

$(2x+3)(2x-3)(4x^2+9)$

stop there...

only

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

because we don't want to have to do this

(b) $3p^8 + 15p^5 + 18p^2$

$3p^2(p^6+5p^3+6)$

$3p^2(p^3+3)(p^3+2)$

z^2+5z+6

$(z+3)(z+2)$