MATH 1010 ~ Intermediate Algebra

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Section 5.4: Factoring by Grouping and Special Forms

Objectives:
✦ Factor the greatest common monomial factors from polynomials.
✦ Factor polynomials by grouping.
✦ Factor the difference of two squares.
✦ Factor the sum and difference of two cubes.
✦ Factor polynomials completely.

\[ a^3 - b^3 = ? \]
\[ x^2 + 2xy + y^2 = ? \]
\[ a^2 + b^2 = ? \]

GCF: Greatest Common Factor

Find the GCF:

a) \[ 5x^4, \ 20x^7, \ 15x^5 \]

b) \[ 21a^4b, \ 12a^5b, \ 15a^5b \]
EXAMPLE:
Factor out the greatest common factor.

a) $24x^3 - 32x^2$

b) $4x^2(3x - 1) - 6(3x - 1)$

c) $x^3 - 5x^2 + x - 5$

d) $(3x + 7)(2x - 1) + (x - 6)(2x - 1)$

Difference of squares
EXAMPLE
Factor these

a) $9x^2 - 25$

b) $a^2 - \frac{1}{16}$

c) $(x + 3)^2 - 49$
5.4 Factoring by Grouping

Sum and Difference of Cubes

\[ u^3 + v^3 \]
\[ u^3 - v^3 \]

Example
Factor these.

a) \( x^3 - 64 \)  
b) \( 8w^3 + 27 \)

c) \( 3x^4 + 81x \)  
d) \( 2a^3 - 32a \)

What about the sum of two squares?

\[ x^2 + y^2 \]