

Objective: Factor polynomials using the sum or difference of cubes.

Factor the following Trinomials that have an $a > 1$:

Foundation:

1) $2x^2 + 9x + 7$
 $\begin{matrix} 14 & & \\ 7 & \times & 2 \\ 9 & & \end{matrix}$
 $(2x^2 + 7x) + (2x + 7)$
 $x(2x + 7) + 1(2x + 7)$
 $(x + 1)(2x + 7)$

2) $3x^2 - 8x + 5$
 $\begin{matrix} 15 & & \\ 5 & \times & 3 \\ -8 & & \end{matrix}$
 $(3x^2 - 5x) + (3x + 5)$
 $x(3x - 5) - 1(3x - 5)$
 $(x - 1)(3x - 5)$

3) $4x^2 - 12x - 7$
 $\begin{matrix} -28 & & \\ -14 & \times & 2 \\ -12 & & \end{matrix}$
 $(4x^2 - 14x) + (2x - 7)$
 $2x(2x - 7) + 1(2x - 7)$
 $(2x + 1)(2x - 7)$

4) $-x^2 - 19x + 20$
 $\begin{matrix} 20 & & \\ 20 & \times & -1 \\ 19 & & \end{matrix}$
 $-(x^2 + 19x - 20)$
 $-(x + 20)(x - 1)$

5) $4x^2 - 5x - 6$
 $\begin{matrix} -24 & & \\ -8 & \times & 3 \\ -5 & & \end{matrix}$
 $(4x^2 - 8x) + (3x - 6)$
 $4x(x - 2) + 3(x - 2)$
 $(4x + 3)(x - 2)$

Notes:

How to factor Polynomials using the sum or difference formula:

1. Draw a small set of parentheses and a large set of parentheses () ()
2. Take the cube root of the front and the cube root of the back
3. Label the front term a and the back term b
4. Plug into the following formula: $(a \quad b)(a^2 \quad ab \quad b^2)$
5. Use the acronym SOAP (Same, Opposite, Always a Positive) for the signs by looking at the original equation

Examples:

1) $x^3 - 27$
 $\begin{matrix} \downarrow & \downarrow \\ x & 3 \\ (a) & (b) \end{matrix}$
 $(x - 3)(x^2 + 3x + 9)$

2) $x^3 + 125$
 $\begin{matrix} \downarrow & \downarrow \\ x & 5 \\ (a) & (b) \end{matrix}$
 $(x + 5)(x^2 - 5x + 25)$

3) $8x^3 + 27$
 $\begin{matrix} \downarrow & \downarrow \\ 2x & 3 \\ (a) & (b) \end{matrix}$
 $(2x + 3)(4x^2 - 6x + 9)$

4) $64x^3 - 125y^3$
 $\begin{matrix} \downarrow & \downarrow \\ 4x & 5y \\ (a) & (b) \end{matrix}$
 $(4x - 5y)(16x^2 + 20xy + 25y^2)$