Objective: To factor polynomial expressions applying a variety of methods.

1.) Difference of squares pattern (only works with subtraction) (binomials)

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

$x^2-4$

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

$x^2-9$

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

$4x^2-81$

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

$3x^2-12$

$3(x^2-4)$

$\boxed{3(x-2)(x+2)}$

$x^2-25$

$x^2+0x-25$

$x \quad -5$

$x \quad 5$

$(x-5)(x+5)$

☆ when $a>1$ remember to always factor out GCF.

2.) Factor by grouping: when there are 4 terms which will typically be cubic.

1.) Factor out GCF, if possible.

2.) Group the first two terms and last two terms, be sure to include their signs.

3.) Factor out GCF from both groups.

4.) Remaining binomial should be the same for both groups. Factor the common binomial.

Example: $8x^3 - 64x^2 + x - 8$

$\frac{8x^3}{8x^2} = x$

$8x^2(x-8) + 1(x-8)$

$\boxed{(x-8)(8x^2+1)}$

Example: $12x^3 + 2x^2 - 30x - 5$

$2x^2(6x+1) - 5(6x+1)$

$\boxed{(6x+1)(2x^2-5)}$

3.) Sum and Difference of cubes : cubic binomials

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

$x^3 + 27$

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

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

$x^3 - 125$

$(x)^3 - (5)^3 = (x-5)(x^2 + 5x + 25)$

cubes

$2^3 = 8$

$3^3 = 27$

$4^3 = 64$

$5^3 = 125$

↓

# Homework: factoring Polynomials

1.) $x^3 + 6x^2 - 5x - 30$

2.) $8x^3 - 64x^2 + x - 8$

3.) $12x^3 + 2x^2 - 30x - 5$

4.) $x^2 - 9$

5.) $81x^2 - 4$

6.) $12x^2 - 27$

7.) $x^3 + 8$

8.) $125x^3 - 8$