Factoring Algorithm Name: _____

	Algorithm *(instructions)*	Example
All Types	3. Put the polynomial in order of decreasing degree (standard form).	$10 + 7x + x^2$ $x^2+7x+10$
	4. Factor out the GCF (include any variables!)	$4x^2 + 14x$ $2x(2x+7)$ ✓
Trinomial **$x^2 + Bx + C$**	If **$A = 1$**, 4. List the pairs of factors of C. 5. Find the pair that has a sum/difference of the target number. 6. Write the two binomials.	$x^2 + 7x + 12$ $(x+3)(x+4)$ 12: 1 12, 2 6, $+3+4=7$ ✓
Trinomial **$x^2 + Bx + C$**	If **$A \neq 1$**, 4. Multiply A and C together and list the pairs of factors. 5. Find the pair that has a sum/difference of the target number. 6. Factor by grouping. *(or factor by trial and error)*	$2x^2 - 3x - 20$ $2x^2+5x-8x-20$ $x(2x+5)-4(2x+5)$ $(2x+5)(x-4)$ 40: 1 40, 2 20, 4 10, 5 −8

BINOMIAL SPECIAL CASE: Difference of Perfect Squares

Binomial $A^2 - B^2$	If it is a **difference of squares**, factor it into conjugates. Formula: $A^2-B^2=(A+B)(A-B)$	$x^2 - 100$ $(x+10)(x-10)$
Binomial $A^2 + B^2$	If it is a **sum of squares**, the binomial is **PRIME**.	$x^2 + 100$

Sum of Binomials Cubed

Formula: $A^3 + B^3 = (A + B)(A^2 - AB + B^2)$

Example	
$A = x$ $B = 5$	$x^3 + 125$
$(x+5)(x^2-5x+25)$ S O AP	

Difference of Binomials Cubed

Formula: $A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

Example	
$A=2x$ $B=3$	$8x^3 + 27$
$(2x+3)(4x^2-6x+9)$	

Factoring

DAY 2

Factor the difference of two squares (DOTS) with the formula: $A^2 - B^2 = (A + B)(A - B)$

1. $1 - 9x^2$

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

2. $x^4 - 1$

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

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

Factor with two variables.

3. $6x^2 + 13xy - 5y^2$

$\frac{6x^2-2xy}{2x} + \frac{15xy-5y^2}{5y}$

$2x(3x-y)+5y(3x-y)$

$\boxed{(3x-y)(2x+5y)}$

30

1 30

−2 +15

3 10

5 6

1. Factor normally without the "y"
2. Put the "y" in at the end

Factor like a quadratic.

4. $4 - 14x^2 - 8x^4$

$-8x^4-14x^2+4$

$-2(4x^4+7x^2-2)$

$-2\left(\frac{4x^4}{x^2} - x^2 + \frac{8x^2}{2} - 2\right)$

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

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

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

8

−1 +8

2 4

5. $x^6 + 2x^3 + 1$

$(x^3+1)(x^3+1)$

$(x^3+1)^2$

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

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

1

+1 +1

Simplify.

6. $\dfrac{(2x-5)\cdot 3x^2 - x^3\cdot 2}{(2x-5)^2}$

$\frac{6x^3-15x^2-2x^3}{(2x-5)^2}$

$\frac{4x^3-15x^2}{(2x-5)^2} = \boxed{\frac{x^2(4x-15)}{(2x-5)^2}}$

7. $3x^2(3x+4)^2 + x^3 \cdot 2(3x+4)\cdot 3$

$\frac{3x^2(3x+4)^2}{3x^2(3x+4)} + \frac{6x^3(3x+4)}{3x^2(3x+4)}$

$3x^2(3x+4)[(3x+4)+2x]$

$\boxed{3x^2(3x+4)(5x+4)}$

FACTORING OUT THE GCF

Factor each expression completely.

1. $5(2x+1)^2+(5x-6)\cdot 2(2x+1)\cdot 2$

$\frac{5(2x+1)^2}{(2x+1)} + \frac{4(5x-6)(2x+1)}{(2x+1)}$

$(2x+1)[5(2x+1)+4(5x-6)]$

$(2x+1)(10x+5+20x-24) = \boxed{(2x+1)(30x-19)}$

2. $3(4x+5)^2\cdot 4(5x+1)^2+(4x+5)^3\cdot 2(5x+1)\cdot 5$

$\frac{12(4x+5)^2(5x+1)^2}{2(4x+5)^2(5x+1)} + \frac{10(4x+5)^3(5x+1)}{2(4x+5)^2(5x+1)}$

$2(4x+5)^2(5x+1)[6(5x+1)+5(4x+5)]$

$2(4x+5)^2(5x+1)(30x+6+20x+25)$

$\boxed{2(4x+5)^2(5x+1)(50x+31)}$

Step 1: Underline each term (separated by + and –)

Step 2: Simplify each term (do not distribute)

Step 3: Find the GCF

Step 4: Factor out the GCF (divide and multiply)

Step 5: Simplify

PRACTICE

Factor out the GCF.

3. $3x^2(8x-3)+x^3\cdot 8$

$\frac{3x^2(8x-3)}{x^2} + \frac{8x^3}{x^2}$

$x^2[3(8x-3)+8x]$

$x^2(24x-9+8x)$

$\boxed{x^2(32x-9)}$

4. $4(x+5)^3(x-1)^2+(x+5)^4\cdot 2(x-1)$

$\frac{4(x+5)^3(x-1)}{2(x+5)^3(x-1)} + \frac{2(x+5)^4(x-1)}{2(x+5)^3(x-1)}$

$2(x+5)^3(x-1)[2+(x+5)]$

$2(x+5)^3(x-1)(2+x+5)$

$\boxed{2(x+5)^3(x-1)(x+7)}$