



### Review of Factoring (All Methods)

★ Always check for a GCF ( greatest common factor ) first!

Example:  $10x^4 + 22x^3 + 2x^2$   
 $2x^2(5x^2 + 11x + 1)$

★ **Grouping Method:** used when there are 4 terms.

Example	$4x^2 - 44x - x + 11$
1. Group the first 2 & last 2 terms.	$(4x^2 - 44x)(-x + 11)$
2. Factor out a GCF from each group.	$(4x)(x-11) - 1(x-11)$
3. Write the final answer as a product of the factors.	$(4x-1)(x-11)$

★ **Trinomials where  $a=1$ .**

Find two numbers that multiply to  $c$  and add up to  $b$ .

Example:  $x^2 + 2x - 15$   
 $(x+5)(x-3)$  m | a  
 $-15 | 2$   
 $5, -3$

★ **Trinomials where  $a > 1$ .**

Find two numbers that multiply to  $a \cdot c$  and add up to  $b$ .

Example:  $2x^2 + 17x + 21$   
 $(2x^2 + 14x) + (3x + 21)$  m | a  
 $42 | 17$   
 $14, 3$   
 $(x+7)3(x+7)$   
 $(2x+3)(x+7)$

★ **Difference of Perfect Squares:** used when there is one perfect square being subtracted from another ( $a^2 - b^2$ ).

Your answer will be in the form  $(a-b)(a+b)$

Example:  $x^2 - 16$   
 $\downarrow \quad \downarrow$   
 $x \quad 4$   
"a" "b"  
 $(x+4)(x-4)$

★ **Sum & Difference of Perfect Cubes:** used when there is one perfect cube being subtracted or added from another.

$a^3 + b^3 = \frac{(a+b)(a^2 - ab + b^2)}{(a-b)(a^2 + ab + b^2)}$   
 $a^3 - b^3 = \frac{(a-b)(a^2 + ab + b^2)}{(a+b)(a^2 - ab + b^2)}$

REMEMBER: Same  
Opposite  
Always  
Positive

Example:  $8x^3 + 1$   
 $\downarrow \quad \downarrow$   
 $2x \quad 1$   
"a" "b"  
 $(2x+1)(4x^2 - 2x + 1)$

Example:  $64x^6 - 125$   
 $4x^2 \quad 5$   
"a" "b"  
 $(4x^2 - 5)(16x^4 + 20x^2 + 25)$

### Mixed Practice

$\sqrt{4x^2} - \sqrt{25}$   
 $\downarrow \quad \downarrow$   
 $2x \quad 5$   
diff of perf  $\square$   
 $(2x+5)(2x-5)$

$\sqrt[3]{x^3} - \sqrt[3]{27}$   
 $\downarrow \quad \downarrow$   
 $x \quad 3$   
SOAP  
 $(x-3)(x^2 + 3x + 9)$

$x^6 - 26x^3 - 27$   
 $(x^3 - 27)(x^3 + 1)$  m | a  
 $\downarrow \quad \downarrow \quad \downarrow \quad \downarrow$   
 $x \quad 3 \quad x \quad 1$   $-27, 1$   
 $(x-3)(x^2 + 3x + 9)(x+1)(x^2 - 1x + 1)$

GCF: 5  $125x^2 + 400xy + 320y^2$   $25 \times 64 = 1600$   
 $5(25x^2 + 80xy + 64y^2)$  mult | add  
 $1600 | 80$   
 $5(25x^2 + 40xy + 40xy + 64y^2)$   $40, 40$   
 $5(5x)(5x+8y) + (8y)(5x+8y)$   
 $5(5x+8y)(5x+8y) = 5(5x+8y)^2$

GCF: 5v  $500v^3 - 1100v^2u + 605vu^2$   $100 \times 121 = 12,100$   
 $5v(100v^2 - 220vu + 121u^2)$  mult | add  
 $12,100 | -220$   
 $5v(100v^2 - 110vu - 110vu + 121u^2)$   $-110, -110$   
 $5v(10v)(10v - 11u) - 11u(10v - 11u)$   
 $5v(10v - 11u)(10v - 11u) = 5v(10v - 11u)^2$

GCF: 2xm  $2x^7m - 54xmy^6$  SOAP  
 $2xm(\sqrt[3]{x^6} - \sqrt[3]{27y^6})$   
 $\downarrow \quad \downarrow$   
 $x^2 \quad 3y^2$   
 $2xm(x^2 - 3y^2)(x^4 + 3y^2x^2 + 9y^4)$

$(x^6 - 3x^4 - x^2 + 3)$  grouping first  
 $(x^4)(x^2 - 3) - 1(x^2 - 3)$   
 $(x^4 - 1)(x^2 - 3)$  now keep going  
 $\downarrow \quad \downarrow$   
 $x^2 \quad 1$  done  
diff of perf  $\square$   
 $(x^2 - 1)(x^2 + 1)(x^2 - 3)$  now keep going  
 $\downarrow \quad \downarrow$   
 $x \quad 1$  done  
diff of perf  $\square$   
 $(x-1)(x+1)(x^2+1)(x^2-3)$   
 nothing else to do = done!