

Notes Factoring by Greatest Common Factor (GCF)

Greatest Common Factor: the largest term that divides evenly into two or more numbers.

Find the GCF of x^4 and x^5 (Use expanded form).

$$x^4 = \underbrace{(x \cdot x \cdot x \cdot x)}_{\text{GCF}}$$

$$x^5 = \underbrace{(x \cdot x \cdot x \cdot x)}_{\text{GCF}} \cdot x$$

GCF: x^4

Find the GCF of x^4 and x^5

$x^4 =$
 $x^5 =$
 Smallest Exponent

GCF: x^4

Find the GCF of x^3y and x^2y^2

$$\underbrace{(x \cdot x \cdot y)}_{\text{GCF}}$$

$$\underbrace{(x \cdot x \cdot x \cdot y \cdot y)}_{\text{GCF}} \cdot x^2y$$

Find the GCF of x^7y^5 and x^3y^3

$$x^3y^3$$

Find the GCF of $15x^3$ and $24x^4$.

$$15x^3 = 1, \textcircled{3}, 5, 15$$

$$24x^4 = 1, 2, \textcircled{3}, 4, 6, 8, 12, 24$$

GCF: $3x^2$

Find the GCF of $30x^4y^2$ and $45xy^3$.

$$30x^4y^2 =$$

$$45xy^3 =$$

GCF: $15xy^2$

Factoring Polynomials by GCF:

GCF: $3x^2$

$$\frac{15x^2 + 24x^3}{3x^2 \cdot 3x^2}$$

$$3x^2(5 + 8x^3)$$

check:

$$3x^2(5 + 8x^3) = 15x^2 + 24x^5$$

Example 2: $12x^4 - 18x^6$

$$\frac{6x^4 \cdot 2}{6x^4 \cdot 3x^2} \text{ GCF: } 6x^4$$

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

check:

$$6x^4(2 - 3x^2) = 12x^4 - 18x^6$$

Steps to Factoring Polynomials using GCF

- 1) Find the GCF of the Coefficients
- 2) Find the GCF of the Variables
- 3) Divide each term by the GCF
- 4) Write GCF on outside of parentheses
- 5) Write "What's left" of each term inside the parentheses
- 6) Check your work

Example 3: $3xy + 15x^2y$

GCF: $3xy$

$$3xy(1 + 5x)$$

check:

$$3xy(1 + 5x) = 3xy + 15x^2y$$

1) $15x^3 + 3x^4$

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

2) $27xy - 36x$

$$9x(3y - 4)$$

3) $45x^3y^5 + 60x^4y^4$

$$15x^2y^5(3 + 4x^2y)$$

4) $56x^3 - 72y^2$

$$8(7x^3 - 9y^2)$$

5) $x^3y - 4x^2y^2 + 12xy^3$

$$xy(x^2 - 4xy + 12y^2)$$

6) $24x^4y^2 - 36x^6y + 60$

$$12(2x^4y^2 - 3x^6y + 5)$$

Notes: Factor by Grouping

To be used when trying to **FACTOR** polynomials that have **FOUR** terms.

Ex 1: $(x^3 + 9x^2 - 2x - 18)$

Steps

Ex 2: $(x^3 - 4x^2 + 3x - 12)$

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

$x^2(x-4) + 3(x-4)$

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

$(x-4)(x^2+3)$

← Group terms together that have common factors into 2 binomials →

← Identify and factor out the GCF of each binomial →

check: $(x+9)(x^2-2)$
 $x^3 + 9x^2 - 2x - 18$ ✓

← Factor out the common binomial factor →

check:

	x	-4
x ²	x ³	-4x ²
+3	+3x	-12

 $x^3 - 4x^2 + 3x - 12$ ✓

1) $x^3 + 9x^2 + 4xy + 36y$ $(x+9)(4y+x^2)$	2) $x^3 - 2x^2 - 9x + 18$ $(x^2-9)(x-2)$ $(x-3)(x+3)(x-2)$	3) $(x^3 - 25x^2 + x - 25)$ $x^2(x-25) + 1(x-25)$ $(x-25)(x^2+1)$
4) $5x^3 + 3x^2 - 25x - 15$ $(x^2-5)(5x+3)$	5) $7x^3 + 7x^2 + 5x + 5$ $(7x^2+5)(x+1)$	6) $6x^3 - 2x^2 + 9x - 3$ $(2x^2+3)(3x-1)$
7) $3x^2 - 2xy + 3x - 2y$ $(x+1)(3x-2y)$	8) $x^4 + 5x^3 - 2x^2 - 10x$ $x(x^2-2)(x+5)$	9) $10x^3 + 5x^2 - 2x - 1$ $(5x^2-1)(2x+1)$
10) $3a^3 + 3ab^2 + 2a^2b + 2b^3$ $(3a+2b)(a^2+b^2)$	11) $5s^2 + 15st - 2st - 6t^2$ $(5s-2t)(s+3t)$	12) $x^4y - 2x^3y + x^4 - 2x^3$ $(x^3y+x^3)(x-2)$