GREATEST COMMON FACTOR

The first step in factorization

Before factoring any polynomial, always first check for the greatest common factor (GCF). The GCF is the largest or greatest number that is common to all the terms and divides into all the terms.

Example 1: $2x^2 + 4x - 8$

The number 2 is the GCF. It is common to all three terms and can also divide into all three terms.

Example 2: $6x^2 - 7x + 3$

There is no GCF because no number can divide into all three of the terms.

Steps for factoring out the greatest common factor

The expressions "factoring out" and "pulling out", will be used interchangeably in describing this process.

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

Step 1 – "Pull out" the GCF: 2 (it is the number than can divide into all terms)

Step 2 – Open a set of parentheses: 2 (   )

Step 3 – Divide each term by the GCF $\frac{2x^2}{2} + \frac{4x}{2} - \frac{8}{2}$

Step 4 – Place the results within the parentheses $2\,(x^2 + 2x - 4)$

(Note - See the back of this page for more examples.)

GREATEST COMMON FACTOR continued

$4x^2 - 16$

Step 1 – "Pull out" the GCF: 4 (it is the number than can divide into all terms)

Step 2 – Open a set of parentheses: 4 (   )

Step 3 – Divide each term by the GCF $\frac{4x^2}{4} - \frac{16}{4}$

Step 4 – Place the results within the parentheses $4\,(x^2 - 4)$

Notice that $(x^2 - 4)$ is a differences of squares and can be factored further:

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

To factor a GCF out of terms containing all variables, divide out the variable with the *lowest* exponent.

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

In the following equation look for a number that can be divided in all terms and then the variable 'x" that is common in all terms.

$6x^3 + 9x^2 - 15x$

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

In the following equation look at the variable "a" first, and then the variable 'b".

$a^2\, b^3 + a^3\, b^2 - a^4\, b^4 + ab$

$ab\,(a\, b^2 + a^2\, b - a^3\, b^3 + 1)$

In the following equation, we can only factor out the "d" variable because "c" is not present in all the terms.

$c^2d - cd^2 - d^3$
$d(c^2 - cd - d^2)$