

## FACTORING CONTINUED

### THE DIFFERENCE OF SQUARES

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

When factoring the difference of squares we look for just that, the difference of two perfect squares. You may need to factor out a common factor to reveal the perfect squares first. Look to the exponents for a clue. If the exponents for both terms are even, there is a chance the problem is an example of the difference of squares.

Why does this happen, why are there two perfect squares separated by a subtraction sign. The answer lies in the multiplication of two binomials.

$(x + 5)(x + 6)$	$(x + 6)(x + 6)$	$(x + 6)(x - 6)$
$x^2 + 6x + 5x + 30$	$x^2 + 6x + 6x + 36$	$x^2 - 6x + 6x - 36$
$x^2 + 11x + 30$	$x^2 + 12x + 36$	$x^2 - 36$

You can see from the multiplication examples above, if the constants of the binomial are different or the same, the result will always be a trinomial. However, when the constants of the binomial are opposites, it results in **adding opposite numbers** which yields a binomial whose terms are both perfect squares.

Example Factor:

$$\begin{aligned} & 225a^6b^4 - 49c^{12} \\ & (\quad)^2 - (\quad)^2 \\ & (15a^3b^2)^2 - (7c^6)^2 \\ & (15a^3b^2 + 7c^6)(15a^3b^2 - 7c^6) \end{aligned}$$

First set up two sets of parentheses both to the second power.

To get the exponents of the factors simply divide the exponents by two. This is just the power rule in reverse. To get the coefficients, take the square root of each number.

If the coefficients are not perfect squares, you may need to first factor out a constant.

**\*Remember, this only works for the difference of squares.**

Factor the following:

1)  $36x^2 - 25$

2)  $81x^{10} - 25y^6z^4$

3)  $64x^2 - 121y^6$

4)  $25x^4 - 9y^4$

5)  $x^4 - 16$

6)  $16a^4 - 81b^8$

## ADVANCED PROBLEMS

$$7) 16x^2 - (5y - 2z)^2$$

$$8) (a + b)^2 - 36c^8$$

$$9) x^2 - y^2 - 2yz - z^2$$

$$10) x^2 + 2xy + y^2 - z^2$$

You can use these properties to make multiplication a bit easier as well.

Multiply:  $(x - 2y)^2 (x + 2y)^2$

Watch for layered problems when factoring difference of squares. There are two types that may show up.

Type A       $x^4 - 26x^2 + 25$

Type B       $x^4 - 16$