

Difference of Squares

Pre-Practice: Multiply the following binomials using FOIL.

$$\begin{array}{lll} \text{a)} & (x-6)(x+6) & \text{b)} & (x-4)(x+4) & \text{c)} & (x-8)(x+8) \\ & = x^2 + \cancel{6x} - \cancel{6x} - 36 & & = x^2 + \cancel{4x} - \cancel{4x} - 16 & & = x^2 + \cancel{8x} - \cancel{8x} - 64 \\ & = \boxed{x^2 - 36} & & = \boxed{x^2 - 16} & & = \boxed{x^2 - 64} \end{array}$$

The answers above are called differences of squares...

How many terms are there in the answers? 2

What is the sign between the terms? -

What do you notice about each term? They're perfect squares.

Factoring Difference of Squares

To factor a difference of squares,

1. Take the square roots of each term.
2. Use these square roots to create two binomial factors with a '-' and a '+' in them.

Examples

Use difference of squares to factor each expression.

$$\begin{array}{llll} \text{a)} & \overset{x}{\circlearrowleft} x^2 - 9 \overset{3}{\rightarrow} & \text{b)} & \overset{x}{\circlearrowleft} x^2 - 81 \overset{9}{\rightarrow} & \text{c)} & \overset{x}{\circlearrowleft} x^2 - 64 \overset{8}{\rightarrow} & \text{d)} & \overset{4x}{\circlearrowleft} 16x^2 - 9 \overset{3}{\rightarrow} & \text{e)} & x^2 + 4 \\ = & (x+3)(x-3) & = & (x+9)(x-9) & = & (x+8)(x-8) & = & (4x+3)(4x-3) & = & \text{can't} \\ & & & & & & & & & \text{factor} \end{array}$$

verify

$$\begin{aligned} & (x+3)(x-3) \\ & = x^2 - \cancel{3x} + \cancel{3x} - 9 \\ & = x^2 - 9 \end{aligned}$$

Practice – Factoring

1. Use difference of squares to factor the following expressions.

a) $x^2 - 49$

$$= (x-7)(x+7)$$

or

$$= (x+7)(x-7)$$

b) $100 - x^2$

$$= (10-x)(10+x)$$

c) $4x^2 - 9$

$$= (2x-3)(2x+3)$$

d) $a^2 - 16$

$$= (a-4)(a+4)$$

e) $9x^2 - 25$

$$= (3x-5)(3x+5)$$

f) $x^2 \oplus 25$

$$= \text{can't factor}$$

2. Trinomial factor the following expressions.

a) $x^2 + 14x + 45$

$$= (x+9)(x+5)$$

b) $x^2 - 3x - 28$

$$= (x-7)(x+4)$$

or

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

c) $x^2 - 12x + 32$

$$= (x-4)(x-8)$$

3. Common factor each expression.

a) $12x - 8$

$$= 4(3x-2)$$

b) $3x + 18x^2$

$$= 3x(1+6x)$$

c) $-7x^2 - 14$

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

4. Common factor each expression then use difference of squares or trinomial factoring.

a) $3x^2 + 24x + 45$

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

$$= 3(x+3)(x+5)$$

b) $-2x^2 + 50$

$$= -2(x^2 - 25)$$

$$= -2(x-5)(x+5)$$

c) $2x^2 - 10x - 48$

$$= 2(x^2 - 5x - 24)$$

$$= 2(x-8)(x+3)$$