

Algebra 1 8.8

Factor binomials that are the difference of squares

Use the "difference of squares" to solve equations

difference

D.O.S.

factor

solve

whiteboards

$$x^2 - 49$$

Look for a pattern...

$$\begin{array}{r} x+5 \\ x-5 \\ \hline \begin{array}{|l} -5x \\ 5x \end{array} \quad -25 \\ \hline x^2 - 25 \end{array}$$
$$\begin{array}{r} a+3 \\ a-3 \\ \hline \begin{array}{|l} -3a \\ 3a \end{array} \quad -9 \\ \hline a^2 - 9 \end{array}$$

$$\begin{array}{r} 2a+7 \\ 2a-7 \\ \hline -14a \quad -49 \\ 4a^2+14a \\ \hline 4a^2-49 \end{array}$$

 **KeyConcept** Difference of Squares

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

Examples $x^2 - 25 = (x + 5)(x - 5)$ or $(x - 5)(x + 5)$

$t^2 - 64 = (t + 8)(t - 8)$ or $(t - 8)(t + 8)$

$$x^2 + 0x - 81$$

$$\begin{array}{r} -81 \\ 9 \quad -9 \\ \hline 0 \end{array}$$

$$\frac{x^2 - 81}{(x + 9)(x - 9)}$$

Is the first thing something squared?
Is the second thing something squared?
Are they subtracted?

$$x^2 - 49 \quad (x + 7)(x - 7)$$

$$n^2 + 64 \quad \underline{\cancel{n \quad 8}}$$

$$x^3 - 36 \quad \underline{\hspace{2cm}}$$

$$4a^2 - 16 \quad (2a + 4)(2a - 4)$$

Example 1 Factor Differences of Squares

Factor each polynomial.

a. $16h^2 - 9a^2$ $(4h - 3a)(4h + 3a)$

Is the first thing something squared?
Is the second thing something squared?
Are they subtracted?

b. $121 - 4b^2$ $(11 + 2b)(11 - 2b)$

Always check for GCF first

$$c. \frac{27g^3}{3g} - \frac{3g}{3g}$$

$$3g(9g^2 - 1)$$

$$3g(3g + 1)(3g - 1)$$

Guided Practice

1A. $81 - c^2$

$$(9 + c)(9 - c)$$

1B. $64g^2 - h^2$

$$(8g + h)(8g - h)$$

GCF?

1C. $9x^3 - 4x$

$$x \left(\underbrace{9x^2}_{3x} - 4 \right)$$

↓

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

Can it be rearranged?

1D. $-4y^3 + 9y$

$$\frac{9y}{y} - \frac{4y^3}{y}$$
$$y(9 - 4y^2)$$
$$y(3+2y)(3-2y)$$

When is it finished? Check your answer...can anything be factored again? Watch out for DOS.

Example 2 Apply a Technique More than Once

Factor each polynomial.

a. $b^4 - 16$

$$(b^2 + 4)(b^2 - 4)$$

$(b^2 + 4)(b + 2)(b - 2)$

$$\begin{array}{r} b+2 \\ b+2 \\ \hline b^2 + 4 \end{array}$$

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

$$2(2x+1)(2x-3)$$

esp. diff of squares...
easy to overlook

b. $625 - x^4$

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

$$(25 + x^2)(5 + x)(5 - x)$$

Guided Practice

2A. $y^4 - 1$

$$(y^2 + 1)(\underline{y^2 - 1})$$
$$(y^2 + 1)(y + 1)(y - 1)$$

2B. $4a^4 - b^4$

$$(2a^2 + b^2)(\underline{2a^2 - b^2})$$

20. $81 - x^4$

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

$$(9 + x^2)(3 + x)(3 - x)$$

21. $16y^4 - 1$

$$(4y^2 + 1)(4y^2 - 1)$$

$$(4y^2 + 1)(2y + 1)(2y - 1)$$

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