Factoring Method #5

Factoring a Difference of Squares

Review:
What is a square?

$1^2 = 1$ $\quad 4^2 = 16$ $\quad 7^2 = 49$

$\square^2 \; 2^2 = 4 \quad 5^2 = 25 \quad 8^2 = 64$

$3^2 = 9 \quad 6^2 = 36 \quad 9^2 = 81$

These are "squares" (that are numbers)

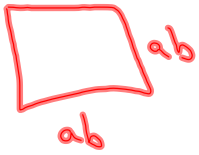
"Square": A term that can be square-rooted perfectly.

Let's look at terms containing letters that are "squares".

A square

a^2b^2

$\sqrt{a^2b^2} = ab$



$ab \times ab = a^2b^2$

$a \cdot b \cdot a \cdot b$

Is x^6 a square? yes

$x^3 \cdot x^3 = x^6$

$\sqrt{x^6} = x^3$

$x \cdot x \cdot x \quad x \cdot x \cdot x = x^6$

Is x^9 a square? No

Whats $\sqrt{x^{26}} = x^{13}$

x^{26} : is a square

Is x^{25} a square? No

Is 25 a square? Yes

Factoring a Difference of Squares:

e.g. $x^2 - 9$

Today's method:

1. Must be a binomial (2 terms)
2. 1st term +, 2nd term −
3. Both terms must be perfect squares.

e.g. 1 $x^2 - 9$

ANS : $(x-3)(x+3)$

Check

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

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

e.g. 2 $y^2 - 25$

$= (y-5)(y+5)$

e.g. 3 $25x^4 - 49$

$(5x^2 - 7)(5x^2 + 7)$

e.g. 4 $a^6 - 100$

$(a^3 - 10)(a^3 + 10)$

e.g. 5 $a^9 - 100$ ← must be even!

Can't factor

e.g. 6 $b^6c^2 - e^8f^4$

$(b^3c + e^4f^2)(b^3c - e^4f^2)$

e.g. 7 $4p^2 - 9q^2$

$(2p - 3q)(2p + 3q)$

e.g 8

$$\frac{x^2y^6}{16} - \frac{81z^8}{49}$$

$$\left(\frac{xy^3}{4} - \frac{9z^4}{7}\right)\left(\frac{xy^3}{4} + \frac{9z^4}{7}\right)$$

e.g. 9

$$x^2 - 1$$

$$(x-1)(x+1)$$

e.g. 10

x^1 ← odd #

$$x - 1$$

Can't factor

Check

$$(x-1)(x+1)$$

$$x^2 + x - x - 1$$

$$x^2 - 1$$

e.g. 11

$$-36 + t^{16}$$

$$t^{16} - 36$$

$$(t^8 - 6)(t^8 + 6)$$

e.g. 12 $\quad -9t^2 + 4x^2$

$$4x^2 - 9t^2$$

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

e.g. 13 $\quad x^2y^6 + 81z^8$

Can't factor

Need "−" in middle

e.g. 14 $-k^4+64$

$64-k^4$

$(8-k^2)(8+k^2)$

e.g. 15 y^4-12x^2

Can't factor.
"12" is not a square.

e.g. 16 $\frac{1}{16}x^{36}-\frac{y^{36}}{121}$

$\left(\frac{1}{4}x^{18}+\frac{y^{18}}{11}\right)\left(\frac{1}{4}x^{18}-\frac{y^{18}}{11}\right)$

e.g. 17 $t^2 - 2v^8$

Can't factor.

2 is not a square.

e.g. 18 $\frac{1}{9}z^{25} - \frac{1}{25}y^{16}$ ← must be even

Can't factor.

z^{25} is not a square

e.g. 19

$$\frac{1}{9}z^{26} - \frac{1}{25}y^{16}$$

$$\left(\frac{1}{3}z^{13} - \frac{1}{5}y^{8}\right)\left(\frac{1}{3}z^{13} + \frac{1}{5}y^{8}\right)$$

e.g. 20

$$x^4 - 1$$

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

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

12

(6) (2)

2 3 2

e.g. 21

$169 - 1.44x^2$ $\qquad \sqrt{144} = 12$

$1.44 =$

$(13 - 1.2x)(13 + 1.2x)$

1.2
1.2
1.44

$\sqrt{x}$

e.g. 22

$1.96 - x^4$

$(1.4 - x^2)(1.4 + x^2)$

e.g. 22 $\qquad 1.21t^2 - 16$

$\sqrt{x}$ $\qquad (1.1t - 4)(1.1t + 4)$

e.g. 23 $\qquad 9cd^4 - 81d^2$

"c" is not a square, so you can't use "diff of square" method.

You can factor it by removing a common factor.

$$\frac{9cd^4 - 81d^2}{9d^2(cd^2 - 9)}$$

Worksheet #7

4 or 6 terms

→ likely groups

→ If not, remove c.f.

2 terms

Likely diff. of squares.

If not, remove c.f.

3 terms

Product-Sum Method

$\_x^2 + \_x + \_\_$

OR

$\_x^2 + \_xy + \_y^2$

If not, remove c.f.

Today

1. Worksheet #6
2. Quiz #5
3. Worksheet #7