

4.5 Special Cases - Quick Factoring "tricks"

○ you can always still factor the "long" way.

Recap - Factor when $a=1$

$$y = x^2 - 3x - 28 \quad \begin{array}{c} A \\ \hline M \end{array}$$

$$y = (\quad) (\quad)$$

Now, factor $y = 4x^2 + 12x + 9$

$$y = \underline{4x^2 + 6x} + \underline{6x + 9}$$

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

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

which is the same as

$$y = (2x+3)^2$$

$$\begin{array}{c} A \\ \hline M \end{array} = \begin{array}{c} 36 \\ 1 \mid 36 \\ 2 \mid 18 \\ 3 \mid 12 \\ 4 \mid 9 \\ \hline 6 \mid 6 \end{array}$$

This is called a perfect square because

$$y = 4x^2 + 12x + 9$$

$$y = \left(\begin{array}{c} \sqrt{4x^2} \\ \downarrow \\ 2x \end{array} + \begin{array}{c} \sqrt{9} \\ \downarrow \\ 3 \end{array} \right)^2$$

In general terms, you have a perfect square if:

Rule

1 - you can $\sqrt{ax^2}$

2 - you can \sqrt{c}

3 - if $2(\sqrt{ax^2})(\sqrt{c}) = b$

i.e. $y = 4x^2 + 12x + 9$

check

$\sqrt{4x^2} = 2x \quad \checkmark$

$\sqrt{9} = 3 \quad \checkmark$

$2(2x)(3) = 12x \quad \checkmark$
(i.e. b)

Ex. 2

$y = 25x^2 + 40x + 16$

if all yes

$y = (5x + 4)^2$

check

$\sqrt{25x^2} = 5x \quad \checkmark$

$\sqrt{16} = 4 \quad \checkmark$

$2(5x)(4) = 40x \quad \checkmark$

(no imp. if +/-)

Ex. 3 try #6 p. 230

Perfect Square - check 3 rules then:

$y = ax^2 + bx + c$

$y = (\sqrt{ax^2} + \sqrt{c})^2$

Difference of Squares - "trick" #2

Factor

$$y = x^2 - 9$$

$$\begin{array}{r} \text{A|M} \\ 0 \mid -9 \end{array}$$

$$\begin{array}{r} -9 \\ 3 \overline{) -9} \\ -9 \\ \hline 0 \end{array}$$

same as $y = x^2 + 0x - 9$

$$y = \underline{x^2 + 3x} - \underline{3x - 9}$$

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

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

$\therefore y = x^2 - 9$

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

Notice it always is true:

$$y = (x+2)(x-2) \rightarrow y = x^2 - 4$$

$$y = (x+4)(x-4) \rightarrow y = x^2 - 16$$

$$y = (x+5)(x-5) \rightarrow y = x^2 - 25$$

How do you know if you have a ~~perfect~~ ^{Diff. of Squares?}

Rules

1 - can $\sqrt{ax^2}$

2 - only 2 ~~terms~~ terms $y = ax^2 - c$

↳ no b

3 - subtraction.

i.e.

$$y = 25x^2 - 9$$

$\sqrt{25x^2}$ $\sqrt{9}$

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

↑ ↑
one + one -

check

$$\sqrt{25x^2} = 5x \quad \checkmark$$

$$\sqrt{9} = 3 \quad \checkmark$$

$$(-) \quad \checkmark$$

$$b = 0 \quad \checkmark$$

Practice p. 230 # 5

Why bother?

- knowing the special cases saves
alot of time factoring the
long way.

Homework p. 230 # 7, 9, 10, 11, 13