

5.3: Factoring Trinomials (with a leading coefficient $\rightarrow 1$)

Note Title

3/26/2015

Ex: Factor.

$$x^2 + 16x - 36$$

$$(x - 2)(x + 18)$$

$$\text{Check: } x^2 + 18x - 2x - 36 \\ = x^2 + 16x - 36 \checkmark$$

$$\underline{\text{Ex: } 2x^2 - 18x + 28}$$

$$= 2(x^2 - 9x + 14) \quad \begin{matrix} (+) \\ \text{want a sum of } 9x \\ \text{same signs} \end{matrix}$$

$$= \boxed{2(x - 2)(x - 7)}$$

$$\text{Check: } (x - 2)(x - 7)$$

$$= x^2 - 7x - 2x + 14$$

$$= x^2 - 9x + 14 \checkmark$$

$$\underline{\text{Ex: } -x^2 + 3x + 54}$$

$$= -1(x^2 - 3x - 54)$$

$$= \boxed{-(x + 6)(x - 9)}$$

$$\text{Check: } (x + 6)(x - 9)$$

$$= x^2 - 9x + 6x - 54$$

$$= x^2 - 3x - 54$$

\rightarrow signs are opposite
want a difference of 3

14
11
1.14
2.7

54
1.54
2.27
3.18
6.9

Ex: Factor.

$$x^2 + 3x - 180$$

$$\boxed{(x - 12)(x + 15)}$$

\rightarrow signs are opposite
want a difference of 3

$$\text{Check: } x^2 + 15x - 12x - 180 \\ = x^2 + 3x - 180 \checkmark$$

$$\begin{array}{r} 12 \\ 15 \\ \hline 60 \\ 12 \\ \hline 180 \end{array}$$

$$3.60 \quad 1.0.180$$

$$12.15 \quad 2.90$$

$$45.4$$

$$18.10$$

$$6.30$$

$$9.20$$

$$5.36$$

180
1
2.90
1
2.45.2
1
2.9.5.2
1
2.3.3.5.2

Ex.. $x^2 + 7x - 12$ (→)
signs are opposite
want a difference of 7

Try: $(x+3)(x-4)$
check $x^2 - 4x + 3x - 12$
 $= x^2 - x - 12$ No!

12
|
1. 12
2. 6
3. 4

This polynomial does not factor.
(This polynomial is prime.)

Prime number: A natural number that can only be factored (using natural number factors) as a product of 1 and itself.

Prime polynomial: cannot be factored (using integer coefficients) except by factoring out ± 1 .

5.3: Factoring Trinomials (when the leading coefficient > 1)

Ex.. Factor.

$2x^2 + 9x + 10$ (+) signs are the same
want a sum of 9x
for middle term

10
|
1. 10
2. 5

Try $(2x + 1)(x + 10)$

Check: $2x^2 + 20x + 1x + 10$
 $= 2x^2 + 21x + 10$ No!

Try $(2x + 10)(x + 1)$

Check: $2x^2 + 2x + 10x + 10$
 $= 2x^2 + 12x + 10$ No!

Try $(2x + 2)(x + 5)$

Check: $2x^2 + 10x + 2x + 10$
 $= 2x^2 + 12x + 10$ No!

Try $(2x + 5)(x + 2)$

Check: $2x^2 + 4x + 5x + 10 = 2x^2 + 9x + 10$ ✓ ok

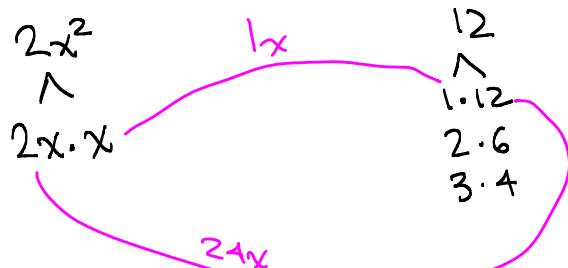
correct answer

Ex: $2x^2 - 25x + 12$ (+) same signs sum of $25x$ for middle term

$$= (2x - 1)(x - 12)$$

Check: $2x^2 - 24x - 1x + 12$

$$= 2x^2 - 25x + 12 \checkmark$$

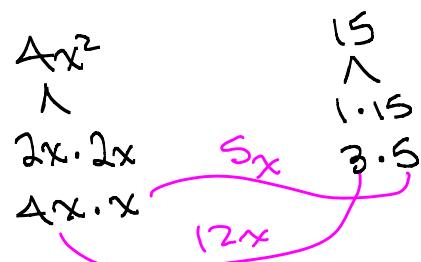


Ex: $4x^2 - 7x - 15$ (-) signs are opposite want a difference of $7x$ for middle term

$$(4x + 5)(x - 3)$$

Check: $4x^2 - 12x + 5x - 15$

$$4x^2 - 7x - 15 \checkmark$$



Ex: $6x^2 + 19x + 14$ (+) same signs want a sum of $19x$ for middle term

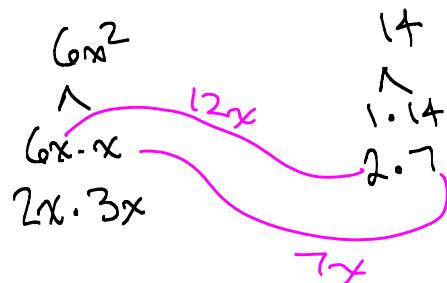
$$(6x + 7)(x + 2)$$

Check:

$$6x^2 + 12x + 7x + 14$$

$$= 6x^2 + 19x + 14 \checkmark$$

Also correct: $(x+2)(6x+7)$



5.4: Difference of Two Squares and Perfect Square Trinomials

Difference of 2 Squares Factorization

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



Check: $(a+b)(a-b)$

$$= a^2 - ab + ab - b^2$$

$$= a^2 - b^2 \checkmark$$

Ex.. Factor.

$$\boxed{x^2 - 49}$$

$$\boxed{(x+7)(x-7)}$$

check: $x^2 - 7x + 7x - 49$
 $= x^2 - 49 \checkmark$

Ex.. $4x^2 - 25y^2$

$$= \boxed{(2x)^2 - (5y)^2}$$

$$= \boxed{(2x - 5y)(2x + 5y)}$$

Ex.. $d^2 - 1$

$$\boxed{(d-1)(d+1)}$$

check: $d^2 + (d-1)d - 1$
 $= d^2 - 1$

Ex.. $2x^3 - 50x$

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

$$= \boxed{2x(x-5)(x+5)}$$

Perfect Square Trinomials

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

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

Ex.. $x^2 - 12x + 36$ (+) same signs want sum of 12x

$$(x-6)(x-6)$$

check: $x^2 - 6x - 6x + 36$

$$\boxed{x^2 - 12x + 36} \checkmark$$

$$\boxed{(x-6)^2}$$

final answer

