5.3: Factoring Trinomials (continued)

Note Title 3/31/2016

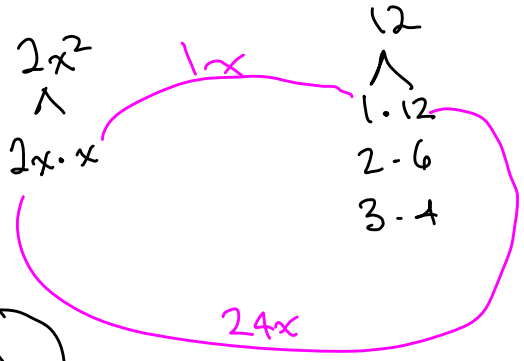
Ex: Factor

$2x^2 - 25x + 12$

(+) signs are the same

want a sum of $25x$ from the Inner and Outer (i.e. FOIL)

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



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

$2x^2 - 25x + 12$ ✓

Also correct: $(x-12)(2x-1)$

Try on your own:

① $6x^2 + 19x + 14$

② $4x^2 + 16x - 9$

③ $6x^2 - x - 15$

④ $10x^2 + 49xy - 5y^2$

⑤ $7x^2 - 10x + 3$

⑥ $48x^2 + 38x - 21$

#2) $4x^2 + 16x - 9$

$4x^2$

$4x \cdot x$

$2x \cdot 2x$

9

$1 \cdot 9$

$3 \cdot 3$

⑥ $48x^2 + 38x - 21$

$(6x + 7)(8x - 3)$

$48x^2$: $1x \cdot 48x$, $2x \cdot 24x$, $3x \cdot 16x$, $4x \cdot 12x$, $6x \cdot 8x$

21 : $1 \cdot 21$, $3 \cdot 7$

$56x$

$18x$

Check: $48x^2 - 18x + 56x - 21$

$48x^2 + 38x - 21$

(-) signs are opposite want a difference of $1x$

③ $6x^2 - x - 15$

$(2x + 3)(3x - 5)$

$6x^2$: $1x \cdot 6x$, $2x \cdot 3x$

15 : $1 \cdot 15$, $3 \cdot 5$

$9x$

$10x$

Check: $6x^2 - 10x + 9x - 15$

$6x^2 - x - 15$ ✓

(-) signs opposite want a difference of $49xy$

④ $10x^2 + 49xy - 5y^2$

$(x + 5y)(10x - y)$

$10x^2$: $1x \cdot 10x$, $2x \cdot 5x$

$5y^2$: $y \cdot 5y$

$50xy$

$1xy$

Check: $10x^2 - xy + 50xy - 5y^2$

$= 10x^2 + 49xy - 5y^2$ ✓

Ex: $18x^2 + 15x - 18$

$3(6x^2 + 5x - 6)$

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

(-) signs are opposite want a difference of $5x$

$6x^2$: $1x \cdot 6x$, $2x \cdot 3x$

6 : $1 \cdot 6$, $2 \cdot 3$

$4x$

$9x$

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

$6x^2 - 4x + 9x - 6$

$6x^2 + 5x - 6$ ✓

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

$= 6x^2 + 4x - 9x - 6$

$= 6x^2 - 5x - 6$

Nope

Ex: $-6x^2+11x-4$

Factor out -1 first!

$-1(6x^2-11x+4)$

(+) signs are the same, I want a sum of $11x$

$-1(2x-1)(3x-4)$

usually written as:

$-(2x-1)(3x-4)$

Factor $6x^2-11x+4$

$6x^2$ $-3x$ $-8x$ $1\cdot 4$ $2\cdot 2$

$2x-3x$

$1x-6x$

Check: $(2x-1)(3x-4)$

$= 6x^2-8x-3x+4$

$= 6x^2-11x+4$ ✓

5.4: Difference of Two Squares and Perfect Square Trinomials

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

$= a^2-b^2$ Know this!

Difference of 2 squares factorization

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

Ex: Factor. x^2-49

$(x+7)(x-7)$ (could write x^2-7^2)

Check: $x^2-7x+7x-49$

x^2-49

Ex: $9x^2 - 4$

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

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

Ex: $100y^2 - 81z^2$

$(10y)^2 - (9z)^2$

$(10y+9z)(10y-9z)$

Check:

$100y^2 - 90yz + 90yz - 81z^2$

$= 100y^2 - 81z^2$

Ex: $x^2 + 36$

Try $(x+6)(x-6)$

$= x^2 - 6x + 6x - 36$

$= x^2 - 36$ Nope

Try $(x+6)(x+6)$

$x^2 + 6x + 6x + 36$

$x^2 + 12x + 36$ Nope

This polynomial is prime

(It cannot be factored)

Important Fact: $a^2 + b^2$ is always prime

$x^2 +$ positive is always prime

Note: $x^2 + 36$. Write as $x^2 + 0x + 36$

(+) signs the same

want a sum of $0x$

Impossible!

Ex: $32x^3 - 50xy^2$

$2x(16x^2 - 25y^2)$

$2x((4x)^2 - (5y)^2)$

$2x(4x+5y)(4x-5y)$

Check it!

Ex: $x^4 - 7x^2 + 12$

$(x^2)^2 - 7x^2 + 12$

Note: $(x^2)^2 = x^4$

Substitute $u = x^2$:

$u^2 - 7u + 12$

$(u-4)(u-3)$

Put x^2 back in for u: $(x^2-4)(x^2-3)$

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

Check:

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

$x^4 - 3x^2 - 4x^2 + 12$

$= x^4 - 7x^2 + 12$ ✓

Perfect Square Trinomials:

Ex: $x^2 + 10x + 25$

$(x+5)(x+5)$

$(x+5)^2$

x^2 ^ $x \cdot x$

25 ^ $1 \cdot 25$, $5 \cdot 5$