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Foundations and Precalculus 10

2.6 – Factoring Special Polynomials

Ex#1: **Perfect Square Trinomial**

$(a+b)^2$

$= (a+b)(a+b)$

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

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

perfect square … perfect square

double the product of the square root of first & last term.

$6 + 6 = 12$, $6 \cdot 6 = 36$ (36)

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

$= (4x^2 + 6x + 6x + 9)$

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

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

Same as

$= (2x+3)^2$

Pattern Observed:

a) The first and third terms are perfect squares: $\sqrt{4x^2} =$ 2x and $\sqrt{9} =$ 3

b) The second term is **twice** the product of the squares of terms *a and c* $2(2x \cdot 3) = 2(6x) = 12x$

a) check first/last terms

You try: $\sqrt{36x^2} + 12x + \sqrt{1}$

b) Check middle term → $2(6x \cdot 1) = 2(6x) = 12x$ ✓

$36x^2 + 12x + 1 = (6x+1)^2$

$\sqrt{16} - 56x + \sqrt{49x^2}$ $2(4 \cdot 7x) = 2(28x) = 56x$

$= (4 - 7x)^2$

★ make your own perfect square trinomial.

Ex#2: **Factor Trinomials with two variables** : no different!

30

$5x^2 - 13xy + 6y^2$

$-10 + -3 = -13$, $-10 \cdot -3 = 30$

Factors of 30 / Sum Factors

$= (5x^2 - 10xy - 3xy + 6y^2)$

$= 5x(x-2y) - 3y(x-2y)$

$= (x-2y)(5x-3y)$

check : $(x-2y)(5x-3y)$

$= 5x^2 - 3xy - 10xy + 6y^2$

$= 5x^2 - 13xy + 6y^2$ ✓

Shorter method: check for...
① both perfect squares
② separated by minus symbol.

Ex#3: **Difference of Squares** → binomial: no middle term
→ both terms perfect squares, separated by minus.

$\sqrt{x^2} - \sqrt{16}$

$= (x+4)(x-4)$

always one plus & one minus.

longer method

$x^2 + 0x - 16$

$4 + -4 = 0$
$4 \cdot -4 = -16$

$= (x^2 + 4x - 4x - 16)$
$= x(x+4) - 4(x+4)$
$= (x+4)(x-4)$

check: $(x+4)(x-4)$
$= x^2 - 4x + 4x - 16$
$= x^2 - 16$ ✓

#4) $\sqrt{49} - \sqrt{c^2}$

$= (7+c)(7-c)$

What if...

#5) $81m^2 - 49$

5) $x^2 + 16 \rightarrow 1x^2 + 0x + 16$

$- + - = 0$
$- \cdot - = 16$

★ nothing multiplies to 16 and adds to 0.

∴ $x^2 + 16$ is **not factorable**.

#6) $3x^2 - 300$ GCF = 3

$= 3(\sqrt{x^2} - \sqrt{100})$
$= 3(x+10)(x-10)$

check: $3(x+10)(x-10)$
$= 3(x^2 - 10x + 10x - 100)$
$= 3(x^2 - 100)$
$= 3x^2 - 300$ ✓

#7) $\sqrt{81x^4} - \sqrt{1}$

another difference of squares

$= (9x^2+1)(\sqrt{9x^2} - \sqrt{1})$
$= (9x^2+1)(3x+1)(3x-1)$

★ always check if you can factor further.

HW p194 #6, 8ab, 10a-f, 11a-d, 12a-c