II. Factoring Trinomials:

Type 2: Polynomials of the form $ax^2 + bx + c$ $a \neq 1$

- Most efficient technique to factor most trinomials of this form is a process know as "DECOMPOSITION".

Consider the binomial product: $(3h + 4)(2h + 1)$

We can use the distributive property to expand:

$$\begin{aligned}(3h + 4)(2h + 1) &= 3h(2h + 1) + 4(2h + 1)\\ &= 6h^2 + 3h + 8h + 4\\ &= 6h^2 + 11h + 4\end{aligned}$$

To factor $6h^2 + 11h + 4$ by decomposition, we reverse the steps above.

How well do we understand??
Fully factor the following as quickly as possible!

Factor

1. $2x^2 + 3x + 1$

$+2$

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

$2x(x+1) + 1(x+1)$

$(x+1)(2x+1)$

2. $2y^2 + 7y + 3$

$+6$

$6 \times 1 = 6$

$6 + 1 = +7$

$2y^2 + 1y + 6y + 3$

$y(2y+1) + 3(2y+1)$

$(2y+1)(y+3)$

3. $2b^2 - 11b + 5$

$-10 \times -1 = 10$

$-10 + -1 = -11$

$2b^2 - 10b - 1b + 5$

$2b(b-5) - 1(b-5)$

$(b-5)(2b-1)$

4. $3b^2 - 13b + 4$

$+12$

$-12 \times -1 = 12$

$-12 + -1 = -13$

$3b^2 - 12b - 1b + 4$

$3b(b-4) - 1(b-4)$

$(b-4)(3b-1)$

*5. $2t^2 - t - 10$ -20

$-5 \times 4 = -20$

$-5 + 4 = -1$

$2t^2 - 5t + 4t - 10$

$t(2t-5) + 2(2t-5)$

$(2t-5)(t+2)$

6. $3p^2 - 16p + 5$

7. $12y^2 - 7y + 1$

*8. $2t^2 + 5t - 12$ -24

$2t^2 + 8t - 3t - 12$

$2t(t+4) - 3(t+4)$

$(t+4)(2t-3)$

Factoring Special Polynomials

III. Perfect Square Trinomials:

Square each of the following binomials:

x $(x+3)^2$ 3

$= x^2 + 6x + 9$

→ 1st & Last Perfect Squares

→ Sq. Root of 1st × Sq. Root of last, Doubled 3w

$(5x+4)^2$

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

$(3x-1)^2$

$= 9x^2 - 6x + 1$

8 576 48

Factor the following trinomial: $9w^2 + 48w + 64$

Plan A:

$9w^2 + 24w + 24w + 64$

$3w(3w+8) + 8(3w+8)$

$(3w+8)(3w+8)$

$(3w+8)^2$

Plan B:

$(3w+8)^2$

sign of middle term

→ Square Root of 1st

Square Root of 3rd term

We say that $a^2 + 2ab + b^2$ is a **perfect square trinomial.**

The square of the 1st term in the binomial

Twice the product of the first and second terms in the binomial

The square of the 2nd term in the binomial

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

How will we reverse this process and FACTOR a perfect square trinomial?

Factor the following trinomial: $\overset{5w}{25w^2} + 40w + \overset{4}{16}$

$= (5w+4)^2$

Factor each of the following if possible:

1. $x^2+8x+16$

$(x+4)^2$

2. $y^2-18y+81$

$(y-9)^2$

3. $100b^2+20b+1$

$(10b+1)^2$

4. $9x^2+42x+49$

$(3x+7)^2$

5. $x^2+22xk+121k^2$

$(x+11k)^2$

$\sqrt{9} = 9^{1/2}$

$\sqrt{x^{10}}$ $^{1/2}$

(x^{10})

6. $x^{10}+8x^5+16$

$(x^5+4)^2$

7. $x^2y^{10}-14xy^5+49$

$(xy^5-7)^2$

8. $3x^2+30x+75$

$3(x^2+10x+25)$

$3(x+5)^2$

$3(x+5)(x+5)$

9. $\overset{3a}{9a^2}+18ab+\overset{3b}{9b^2}$

$(3a+3b)^2$

$(3x+15)(x+5)$

$3(x+5)(x+5)$