

### 3.8 Factoring Special Polynomials

I. A Perfect Square Trinomial ... is of the form

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

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

or

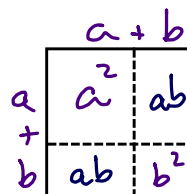
$$= (a-b)^2$$

$$(a-b)(a-b)$$

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

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

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



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

\* A trinomial is a perfect square if the middle term coefficient =  $\pm 2\sqrt{a}\sqrt{b}$

ex.  $4a^2 + 12a + 9$

$$\underline{b \cdot b} = 36$$

$$\underline{b + b} = 12$$

When the two numbers are the same, it is a P.S.T.

ex.  $36y^2 + 12y + 1$

$$= (6y + 1)^2$$

$$\underline{b \cdot b} = 36$$

$$\underline{b + b} = 12$$

ex.  $4z^2 - 20z + 25x^2$

$$= (2 - 5x)^2$$

check with expansion

$$(2 - 5x)(2 - 5x)$$

$$= 4 - 20x + 25x^2$$

$-10$	$\cdot$	$-10$	$= 100$
$-10$	$+$	$-10$	$= -20$

same

#### II. 2-Variable Trinomials

If the trinomial is of the form  $ax^2 + bxy + cy^2$  factor it as though it is either a simple (3.5) or complex (3.6) trinomial but add the extra variable in the appropriate spot.

ex.  $2a^2 - 7ab + 3b^2$

$$\underline{-b \cdot -1} = b$$

$$\underline{-6 + -1} = -7$$

$$= (2a^2 - 6ab) + (-ab + 3b^2)$$

$$= 2a(a - 3b) - b(a - 3b)$$

$$= (a - 3b)(2a - b)$$

ex.  $10c^2 - cd - 2d^2$

$$\underline{-5 \cdot 4} = -20$$

$$\underline{-5 + 4} = -1$$

$$= (10c^2 - 5cd) + (4cd - 2d^2)$$

$$= 5c(2c - d) + 2d(2c - d)$$

$$= (2c - d)(5c + 2d)$$

ex.  $16y^2 - 56xy + 49x^2$

$$\underline{-28 \cdot -28} = 784$$

$$\underline{-28 + -28} = -56$$

same!

$$= (4y - 7x)^2$$

III. A Difference of Squares ... is of the form

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

*subtraction*

*+0ab = 0 ... nothing*

ex. a)  $25 - 36y^2$

$$= (5 - 6y)(5 + 6y)$$

b)  $9x^2 - 49$

$$= (3x - 7)(3x + 7)$$

c)  $121x^4y^2 - 64y^8$

$$= (11x^2y - 8y^4)(11x^2y + 8y^4)$$

d)  $5x^4 - 80y^4$

$$= 5(x^4 - 16y^4)$$

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

*still a D.O.S.*

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

e)  $162a^4 - 2w^8$

$$= 2(81a^4 - w^8)$$

$$= 2(9a^2 + w^4)(9a^2 - w^4)$$

$$= 2(9a^2 + w^4)(3a - w^2)(3a + w^2)$$