TOPIC: FACTORING SPECIAL PRODUCTS

Difference of Squares

◆ Recall: Multiplying the sum & difference of 2 terms (conjugates) results in:

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

(Difference of squares)

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Name	**Rule**	**Use if there are…**	**Example**
Difference of Squares	$a^2-b^2=(\quad+\quad)(\quad-\quad)$	___ terms that: • are perfect __________ • have __________ signs	x^2-4 $=(\quad)^2-(\quad)^2$ $=(\quad+\quad)(\quad-\quad)$

◆ Note: a^2+b^2 is NOT a difference of squares, but a **sum**, and it __________ be factored.

EXAMPLE Factor each binomial.

(A) $16-9x^2$

(B) y^2+25

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PRACTICE Write the following difference of squares as a product of two binomials.

(A) $k^2 - 49$

(B) $81 - G^2$

EXAMPLE Completely factor the binomial.

(A) $x^4 - 16$

(B) $-150 + 6x^2$

(C) $12y^2 - 27x^2$

EXAMPLE Completely factor the binomial.

$(z+5)^2 - 81$

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Perfect Square Trinomials

◆ Recall: Squaring a binomial results in a perfect square trinomial:

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

Name	Rule	Use if there are…	Example
Perfect Square Trinomials	$a^2 + 2ab + b^2 = (a \quad b)^2$ $a^2 - 2ab + b^2 = (a \quad b)^2$	___ terms in which: • first & last terms are perfect ___________ (always positive) • middle term is ______	$x^2 + 10x + 25$ $= (\quad)^2 + 2(\quad)(\quad) + (\quad)^2$ $= (\qquad)^2$

EXAMPLE Factor completely.

$4x^2 - 36x + 81$

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PRACTICE Factor completely.

$(\boldsymbol{A})$

$x^2 - 40x + 400$

$(\boldsymbol{B})$

$4m^2 + 20m + 25$

PRACTICE Factor completely. *Hint: Factor out the GCF first.*

$(\boldsymbol{A})$

$12x^2 + 48x + 48$

$(\boldsymbol{B})$

$-4y^3 - 24y^2 - 36y$

EXAMPLE Factor completely.

$(\boldsymbol{A})$

$x^2 + 6xy + 9y^2$

$(\boldsymbol{B})$

$10a^2b - 20ab^2 + 10b^3$

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EXAMPLE Multiply the polynomials.

$(\boldsymbol{A})$

$$(a+b)\,(a^2-ab+b^2)$$

$(\boldsymbol{B})$

$$(a-b)\,(a^2+ab+b^2)$$

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Sum and Difference of Cubes

◆ The following products result in a sum or difference of cubes:

New

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

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

Name	Rule	Use if there are…	Example
Sum of Cubes	$a^3+b^3=(a\quad b)(a^2\quad ab+b^2)$	___ terms that are perfect __________	x^3+8 $=(\quad)^3+(\quad)^3$ $=(\quad+\quad)(\quad-\quad+\quad)$
Difference of Cubes	$a^3-b^3=(a\quad b)(a^2\quad ab+b^2)$		

◆ We can use this acronym to remember the **signs** within the factors: **S**ame, **O**pposite, **A**lways **P**ositive

EXAMPLE Factor completely.

$27y^3-1$

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PRACTICE Factor completely.

$(\boldsymbol{A})$ $27x^3 + 125$

$(\boldsymbol{B})$ $y^3 - \frac{1}{27}$

EXAMPLE Factor completely.

$(\boldsymbol{A})$ $\frac{2}{3}x^3 - \frac{2}{3}y^3$

$(\boldsymbol{B})$ $16x^3 + 54y^3$

EXAMPLE Factor completely.

$(\boldsymbol{A})$ $3yx^3 - 81y^4$

$(\boldsymbol{B})$ $(p+q)^3 - 27r^3$