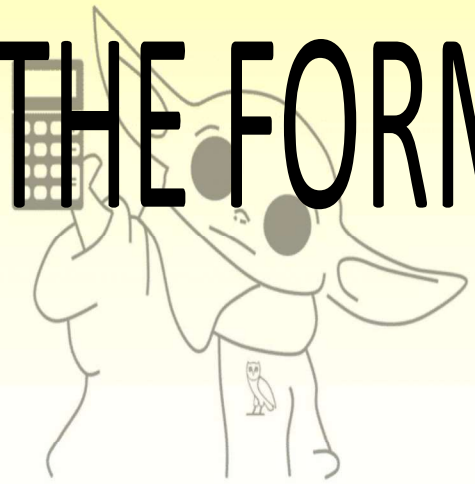
St. Jean de Brebeuf
Mathematics

CHAPTER 5.4

FACTOR TRINOMIALS OF THE FORM

$$y = ax^2 + bx + c$$



CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

KEY CONCEPTS

To factor a trinomial of the form $\boldsymbol{ax^2 + bx + c}$, where $\boldsymbol{a \neq 1}$,
→first use **common factoring** to factor ***a*** out of each term.
→ the co-efficient in front of *x* always has to be positive
→then, express the trinomial factor as a product of binomial factors (ie. Simple trinomial, difference of squares)

When working with formulas, it is often useful to factor the expression to simplify calculations

CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

EXAMPLE 1 *Factor $ax^2 + bx + c$*

Factor the following trinomials:

(a) $\frac{4x^2}{4} + \frac{20x}{4} + \frac{24}{4}$ GCF = 4

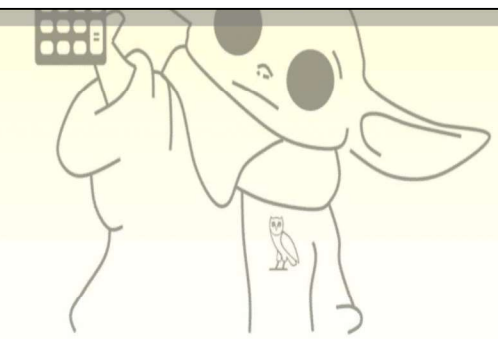
$= 4(x^2 + 5x + 6)$ P = +6, S = +5 → +3, +2

$= 4(x + 3)(x + 2)$

STEPS

→**Common factor** by finding the **greatest common factor (GCF)** and dividing each term by the GCF

→Factor the remaining terms by finding the **product (P)** and the **sum (S)**



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CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

EXAMPLE 1 *Factor $ax^2 + bx + c$*

Factor the following trinomials:

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

$-2 \quad -2 \quad -2$

$= -2(x^2 - 2x - 8)$

P = -8 : -4, $+2$

S = -2

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

Negative must be included in GCF to make x^2 must be positive

(c) $3x^2 + 18x - 21$ GCF = 3

$3 \quad 3 \quad 3$

$= 3(x^2 + 6x - 7)$

P = -7 : $+7$, -1

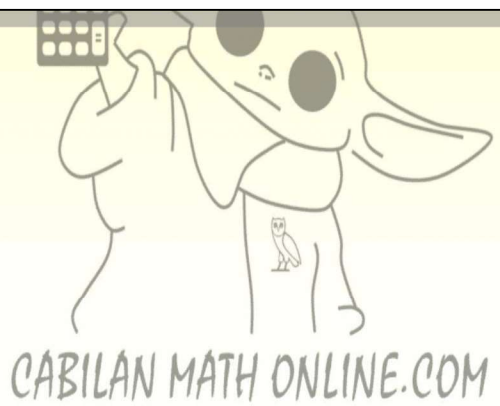
S = $+6$

$= 3(x + 7)(x - 1)$

STEPS

→**Common factor** by finding the **greatest common factor (GCF)** and dividing each term by the GCF

→Factor the remaining terms by finding the **product (P)** and the **sum (S)**



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CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

EXAMPLE 2 *Factor a Polynomial*

* (a) $\frac{2x^2}{2} - \frac{50}{2}$ GCF = 2

$= 2(x^2 - 25)$

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

$\sqrt{x^2} =$ x

$\sqrt{25} =$ 5

Create two sets of brackets (one with "+", one with "-)

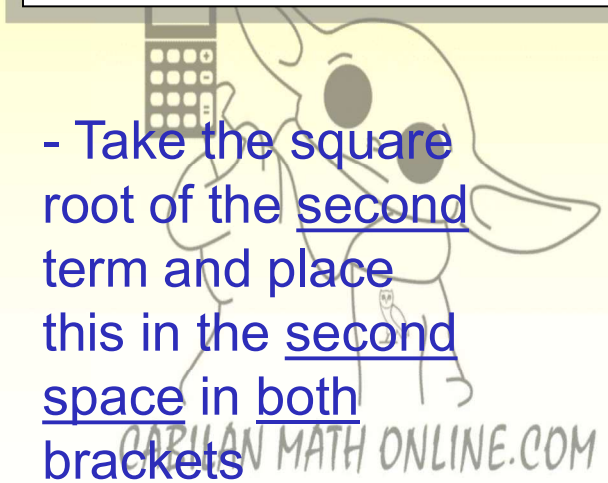
- Take the square root of the first term and place this in the first space in both brackets

- Take the square root of the second term and place this in the second space in both brackets

STEPS

→**Common factor** by finding the **greatest common factor (GCF)** and dividing each term by the GCF

→Factor the remaining terms by **difference of squares** (if required) *



CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

EXAMPLE 2 *Factor a Polynomial*

* (b) $-3x^2 + 48$

GCF = -3

$\frac{-3x^2}{-3} + \frac{48}{-3}$

$= -3(x^2 - 16)$

Negative must be included in GCF to make x^2 postive

$= -3(x + 4)(x - 4)$

Create two sets of brackets (one with "+", one with "-)

$\sqrt{x^2} =$ x

$\sqrt{16} =$ 4

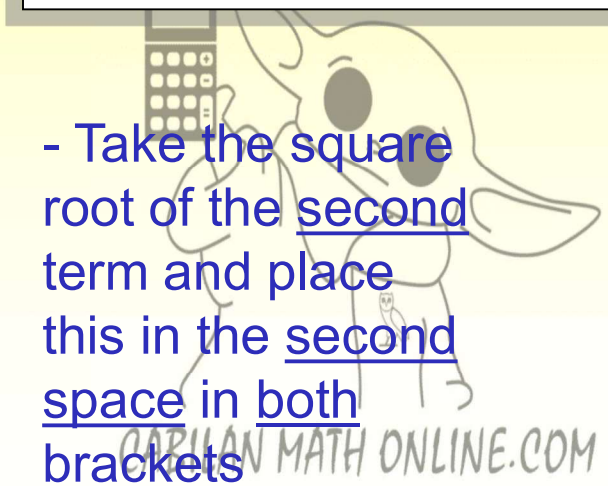
- Take the square root of the first term and place this in the first space in both brackets

- Take the square root of the second term and place this in the second space in both brackets

STEPS

→**Common factor** by finding the **greatest common factor (GCF)** and dividing each term by the GCF

→Factor the remaining terms by **difference of squares** (if required) *



CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

EXAMPLE 2 *Factor a Polynomial*

(c) $-4.9t^2 + 19.6t$ GCF = $-4.9t$

$-4.9t \quad -4.9t$

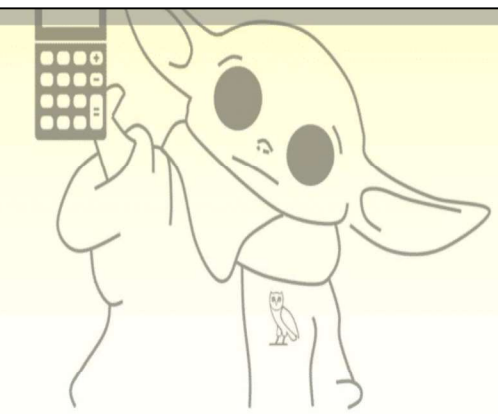
$= -4.9t\,(\,t \quad -4\quad)$

Negative must be included in GCF to make t^2 postive

STEPS

→**Common factor** by finding the **greatest common factor (GCF)** and dividing each term by the GCF

→Factor the remaining terms by **difference of squares** (if required) *



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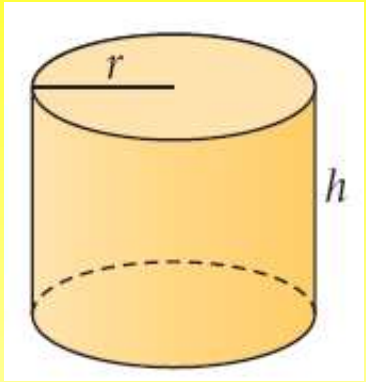
CHAPTER 5.4 FACTOR TRINOMIALS OF THE FORM $y = ax^2 + bx + c$

EXAMPLE 3

Application: Simplify Formulas by Factoring



The surface area of a cylinder is given by the formula **S.A. = $2\pi r^2 + 2\pi rh$**.

(a) **Factor** the expression for *Surface Area*

$$SA = \frac{2\pi r^2}{2\pi r} + \frac{2\pi rh}{2\pi r} \qquad GCF = 2\pi r$$

$$SA = 2\pi r(r + h)$$

Common factor by finding the **greatest common factor (GCF)** and dividing each term by the GCF

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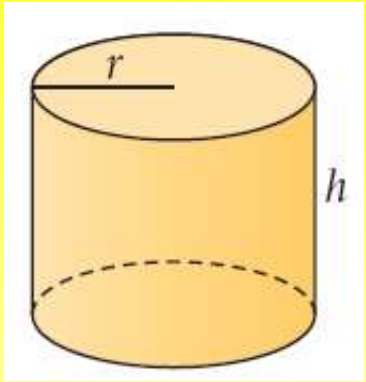
EXAMPLE 3

Application: Simplify Formulas by Factoring



The surface area of a cylinder is given by the formula **S.A. = $2\pi r^2 + 2\pi rh$**.

(b) Using the original expression and the factored expression, calculate the *Surface Area* of a cylinder when **radius is 3 cm** and **height** is **10 cm**

r **h**

ORIGINAL EXPRESSION

$SA = 2\pi r^2 + 2\pi rh$

$SA = 2\pi(3)^2 + 2\pi(3)(10)$

$= \mathbf{245.0443\ cm^2}$

FACTORED EXPRESSION

$SA = 2\pi r(r + h)$

$= 2\pi(3)(3 + 10)$

$= 2\pi(3)(13)$

$= \mathbf{245.0443\ cm^2}$

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The surface area is **245.0443 square centimetres**.

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Homework:

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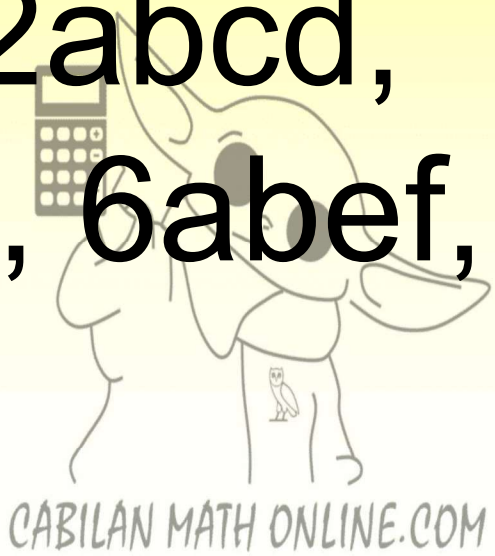
(Day 1) #1abcd, 2abcd, 3ac, 4abce, 5abce, 6abef, 8ab, 9, 10