

USING STRUCTURE TO FACTOR

We've now seen five primary types of factoring: (1) greatest common factors, (2) the difference of perfect squares, (3) the sum and difference of perfect cubes (4) trinomial factoring, and (5) factoring by grouping. The last type of factoring takes advantage of the structure of the polynomial after GCF factoring.

Ex#1: Consider the following expression: $(x+6)^2 + 2(x+6) - 35$

(a) Which type of factoring does the overall structure of this expression suggest?

Tram
↳ 3 terms

(b) Simplify the expression in so that it is factored completely.

$$\begin{aligned} \text{let } y &= x+6 \\ y^2 + 2y - 35 & \quad \begin{array}{r} -35 \\ 7 \times -5 \\ 2 \end{array} \\ (y+7)(y-5) & \\ (x+6+7)(x+6-5) & \\ (x+13)(x+1) & \end{aligned}$$

Ex#2: Consider the following expression: $(5x+2)^2 - (2x-1)^2$

(a) Which type of factoring does the overall structure of this expression suggest?

Dots

(b) Simplify the expression in so that it is factored completely.

$$\begin{aligned} \text{let } A &= 5x+2 \\ \text{let } B &= 2x-1 \\ A^2 - B^2 & \\ (A+B)(A-B) & \\ (\underline{5x+2} + \underline{2x-1})(\underline{5x+2} - \underline{(2x-1)}) & \\ (7x+1)(5x+2-2x+1) & \\ (7x+1)(3x+3) & \end{aligned}$$

USING STRUCTURE TO FACTOR PRACTICE

1.) Which of the following is the correct factorization of $4x^2 - (x+5)^2$?

(1) $(3x+5)(2x-5)$

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

(2) $(2x+5)(2x-3)$

(4) $(2x+5)(2x-5)$

let $A = 2x$

let $B = x+5$

$A^2 - B^2$

$(A+B)(A-B)$

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

$(3x+5)(2x-x-5)$

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

2.) Which of the following is equivalent to $(2x+1)^2 - 2(2x+1) - 3$?

(1) $(2x+3)(x-2)$

(3) $(4x+1)(x-5)$

(2) $4(x-1)(x+1)$

(4) $2(2x+1)(x-2)$

let $y = 2x+1$

$y^2 - 2y - 3$ $\begin{matrix} -3 & \times & 1 \\ & -2 & \end{matrix}$

$(y-3)(y+1)$

$(2x+1-3)(2x+1+1)$

$(2x-2)(2x+2)$

$2(x-1) \quad 2(x+1)$

$4(x-1)(x+1)$



** How can I use my calculator to help me on these questions? **

→ store a value for x and see what choice is equal

→ put each choice into y= and look at what one is the same as the one in the question

3.) Factor completely: $(x+2)^2 - (x+2) - 6$

let $y = x+2$

$$y^2 - y - 6$$

$$(y+2)(y-3)$$

$$(x+2+2)(x+2-3)$$

$$(x+4)(x-1)$$

$$\begin{array}{r} -6 \\ 2 \times -3 \\ -1 \end{array}$$

4.) Factor completely: $(2x-3)^2 - (6x+1)^2$

let $A = 2x-3$

let $B = 6x+1$

$$A^2 - B^2$$

$$(A+B)(A-B)$$

$$(\underline{2x-3} + \underline{6x+1})(\underline{2x-3} - \underline{6x+1})$$

$$(8x-2)(2x-3-6x-1)$$

$$(8x-2)(-4x-4)$$

$$2(4x-1) - 4(x+1)$$

$$-8(4x-1)(x+1)$$

5.) Rewrite the expression $(4x^2 + 5x)^2 - 5(4x^2 + 5x) - 6$ as a product of four linear factors.

let $y = 4x^2 + 5x$

$$y^2 - 5y - 6$$

$$(y-6)(y+1)$$

$$(4x^2 + 5x - 6)(4x^2 + 5x + 1)$$

$$(4x^2 + 8x - 3x - 6)(4x^2 + 4x + 1x + 1)$$

$$(4x(x+2) - 3(x+2))(4x(x+1) + 1(x+1))$$

$$(x+2)(4x-3)(x+1)(4x+1)$$

$$\begin{array}{r} -24 \\ 8 \times -3 \\ 5 \end{array}$$

$$\begin{array}{r} -6 \\ -6 \times 1 \\ -5 \end{array}$$

$$\begin{array}{r} 4 \\ 4 \times 1 \\ 5 \end{array}$$

Answers

1. Choice 3

2. Choice 2

3. $(x - 1)(x + 4)$

4. $-8(x + 1)(4x - 1)$

5. $(4x - 3)(x + 2)(4x + 1)(x + 1)$