


Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases




Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Learning Goals

- A polynomial of the form $a^2x^2 \pm 2abx + b^2$ is a perfect-square trinomial and can be factored as $(ax \pm b)^2$.
- A polynomial of the form $a^2x^2 - b^2$ is a difference of squares and can be factored as $(ax - b)(ax + b)$.



Functions and Applications


Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Squares:

X	Y
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64

X	Y
9	81
10	100
11	121
12	144
13	169
14	196
15	225
16	256



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

1. Perfect Squares

$$a^2x^2 + 2abx + b^2$$

Examples:

$$9x^2 + 12x + 4 \text{ (where } a=3, b=2\text{)}$$

$$49x^2 - 56x + 16 \text{ (where } a=7, b=-4\text{)}$$



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

1. Perfect Squares

Form: $a^2x^2 + 2abx + b^2$

$$a^2x^2 + 2abx + b^2 = (ax + b)^2$$

Example:

$$36x^2 + 84x + 49 = (6x + 7)^2$$



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

1. Perfect Squares

Form: $a^2x^2 + 2abx + b^2$

Example:

$$4x^2 - 72x + 81 \quad - \text{ Notice that } a=2, b=-9$$

$$= (2x - 9)(2x - 9)$$

$$= (2x - 9)^2$$



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

1. Perfect Squares

Form: $a^2x^2 + 2abx + b^2$

Example:

$$x^2 + 6x + 9 \quad - \text{ Notice that } a=1, b=3$$

$$= (x + 3)(x + 3)$$

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



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

2. Difference of Squares

$a^2x^2 - b^2$

Examples:

$$25x^2 - 9 \quad (\text{where } a=5, b=3)$$

$$4x^2 - 64 \quad (\text{where } a=2, b=8)$$



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

2. Difference of Squares

Form: $a^2x^2 - b^2$

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

Example:

$$16x^2 - 1 = (4x - 1)(4x + 1)$$



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

2. Difference of Squares

Form: $a^2x^2 - b^2$

Example:

$$9x^2 - 64 \quad - \text{Notice that } a = 3, b = 8$$
$$= (3x - 8)(3x + 8)$$



Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

2 special cases:

2. Difference of Squares

Form: $a^2x^2 - b^2$

Example:

$$x^2 - 25 \quad - \text{Notice that } a = 1, b = 5$$
$$= (x - 5)(x + 5)$$



Functions and Applications


Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Difficult Examples:

$$400x^2 - 169y^2 \quad - \text{Notice that } a = 20, b = 13$$
$$= (20x - 13y)(20x + 13y)$$

Notice that the y must be present in both factors for this to work.



Functions and Applications


Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Difficult Examples:

$$\begin{aligned} & 196a^2 - 420ab + 225b^2 \quad - \text{Notice that 'a' = 14, 'b' = 15} \\ & = (14a - 15b)(14a - 15b) \\ & = (14a - 15b)^2 \end{aligned}$$

Again notice that a and b must be present for this to work.



Functions and Applications


Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Difficult Examples:

Common factoring and Special Case

$$\begin{aligned} & -27x^2 + 36x - 12 \\ & = -3(9x^2 - 12x + 4) \quad - \text{Notice that 'a' = 3, 'b' = 2} \\ & = -3(3x - 2)(3x - 2) \\ & = -3(3x - 2)^2 \end{aligned}$$



Functions and Applications


Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Difficult Examples:

Difference of Squares **AND** Perfect Square

$$\begin{aligned} & x^2 + 4x + 4 - y^2 \\ & = (x^2 + 4x + 4) - y^2 \quad - \text{Notice that 'a' = 1, 'b' = 2} \\ & = (x + 2)(x + 2) - y^2 \\ & = (x + 2)^2 - y^2 \quad - \text{Now we have a difference of squares} \\ & = [(x + 2) - y][(x + 2) + y] \end{aligned}$$



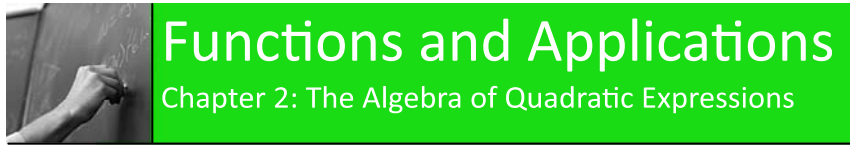
Functions and Applications

Chapter 2: The Algebra of Quadratic Expressions

2.5 Factoring Quadratic Expressions: Special Cases

Homework:

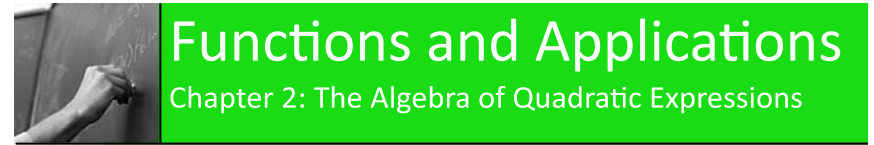
Page 115 - Questions 2,3,4,7, 11



Unit 2: Chapter Review

Homework:

page 120 - Questions 1-19



Unit 2: Chapter Self Test

Homework:

page 122 - Questions 1-10