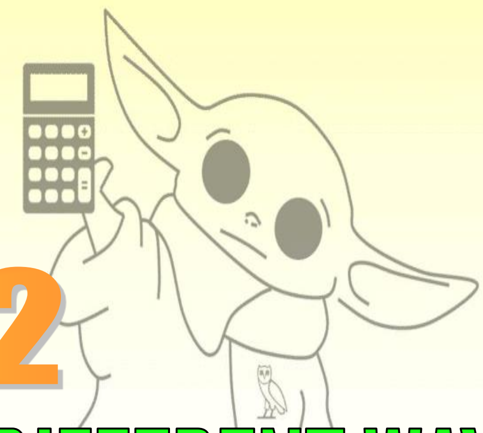
ST. JEAN DE BREBEUF MATHEMATICS



CHAPTER 8.2

REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

CHAPTER 8.2 REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

KEY CONCEPTS

A **quadratic relation** can be expressed several ways. In this lesson we will look at the two listed below.

STANDARD FORM

A quadratic relation in *standard form* is expressed in the form $\mathbf{y = ax^2 + bx + c}$, where $a \neq 0$

The **"c"** term is the **y-intercept** of the relation

Any quadratic relation in standard form can be **factored** and expressed in *factored form*

FACTORED FORM

Any quadratic relation in the *factored form* is expressed in the form $\mathbf{y = a(x - r)(x - s)}$

The **"r"** and the **"s"** represent the **x-intercepts** of the relation

The x-intercepts are also known as the **zeros**

→When solving for the *zeros,* you let $\mathbf{y = 0}$ and you solve for each $\mathbf{x}$ separately

CABILAN MATH ONLINE.COM

CHAPTER 8.2 REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

KEY CONCEPTS

STANDARD FORM

A quadratic relation in *standard form* is expressed in the form **y = ax² + bx + c** where a ≠ 0

The **"c"** term is the **y-intercept** of the relation

Any quadratic relation in standard form can be **factored** and expressed in *factored form*

FACTORED FORM

Any quadratic relation in the *factored form* is expressed in the form **y = a(x – r)(x – s)**

The **"r"** and the **"s"** represent the **x-intercepts** of the relation

The x-intercepts are also known as the **zeros**

→When solving for the *zeros*, you let **y = 0** and you solve for each **x** separately

The **"a"** value for both *standard* and *factored* form are the same

→When **a** is positive, the parabola opens up and has a **minimum**

→When **a** is negative, the parabola opens down and has a **maximum**

CHAPTER 8.2 REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

EXAMPLE 1 *Analyzing a Quadratic Relation*

(a) Given the quadratic relation $\mathbf{y = x^2 + 8x + 15}$

(i) Does this relation have a **minimum** or **maximum** value? How do you know?

Look at the **a** value
→**a = 1**
→**a** is positive
→ Parabola opens up
→Has a **minimum value**

(ii) What is the **y-intercept** of this relation?

Look at the **c** value
→The y-intercept is **15**

EXAMPLE 1 *Analyzing a Quadratic Relation*

(a) Given the quadratic relation $\mathbf{y = x^2 + 8x + 15}$

(iii) Factor the trinomial. This will give you the *factored form*.

$y = x^2 + 8x + 15$

$y = (x + 5)(x + 3)$

P = 15

S = 8

+ 5

+ 3

(iv) Using the *factored form* from (iii), determine the zeros

When finding zeros, you let **y =** 0

$y = (x + 5)(x + 3)$

$0 = (x + 5)(x + 3)$

1st zero

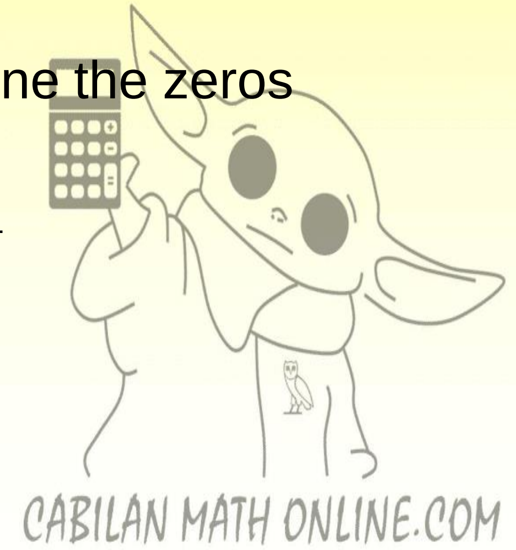
$0 = x + 5$

$-5 = x$

2nd zero

$0 = x + 3$

$-3 = x$



CHAPTER 8.2 REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

EXAMPLE 1 *Analyzing a Quadratic Relation*

(b) Given the quadratic relation $\mathbf{y = x^2 + 2x - 8}$

(i) Does this relation have a **minimum** or **maximum** value? How do you know?

Look at the **a** value

→**a = 1**

→**a** is <u>positive</u>

→ Parabola <u>opens up</u>

→Has a **minimum value**

(ii) What is the **y-intercept** of this relation?

Look at the **c** value

→The y-intercept is **– 8**

CHAPTER 8.2 REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

EXAMPLE 1 *Analyzing a Quadratic Relation*

(b) Given the quadratic relation $\mathbf{y = x^2 + 2x - 8}$

(iii) Factor the trinomial. This will give you the *factored form*.

$y = x^2 + 2x - 8$

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

P = -8

S = 2

$+4$

-2

(iv) Using the *factored form* from (iii), determine the zeros

When finding zeros, you let **y =** 0

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

$0 = (x + 4)(x - 2)$

1st zero

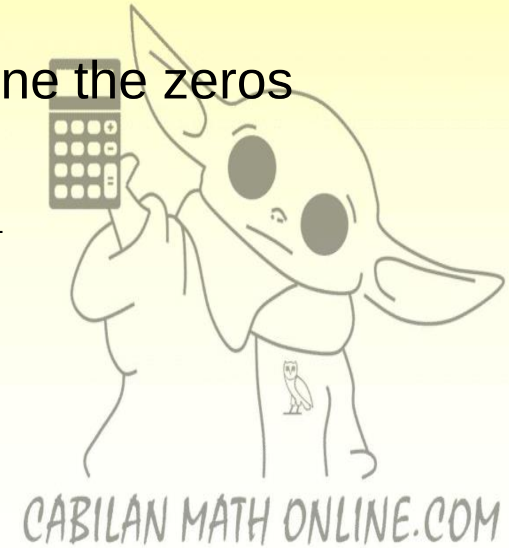
$0 = x + 4$

$-4 = x$

2nd zero

$0 = x - 2$

$+2 = x$



CHAPTER 8.2 REPRESENT QUADRATIC RELATIONS IN DIFFERENT WAYS

EXAMPLE 2 *Interpret a Quadratic Relation*

The curve formed by a rope bridge can be modelled by the relation $\mathbf{y = x^2 - 9x + 18}$, where ***x* is the horizontal distance in metres** and ***y* is the height in metres**.

(i) Factor the trinomial. This will give you the *factored form*.

$y = x^2 - 9x + 18$

P = 18 → – 6

S = – 9 → – 3

$y = (x - 6)(x - 3)$

(ii) Using the *factored form* from (i), determine the zeros

When finding zeros, you let **y =** 0

$y = (x - 6)(x - 3)$

$0 = (x - 6)(x - 3)$

1st zero

$0 = x - 6$

$6 = x$

2nd zero

$0 = x - 3$

$3 = x$

CABILAN MATH ONLINE.COM

EXAMPLE 2 *Interpret a Quadratic Relation*

The curve formed by a rope bridge can be modelled by the relation $\mathbf{y = x^2 - 9x + 18}$, where ***x* is the horizontal distance in metres** and ***y* is the height in metres**.

(iii) What is the **horizontal distance** of the bridge from one end to the other?

Since the *x* represents the horizontal distance, we can use the **zeros** and find the difference between them

$6 - 3$

$= \mathbf{3}$ **metres**

The horizontal distance of the bridge from one end to the other is **3 metres**

(ii) Using the *factored form* from (i), determine the zeros

When finding zeros, you let **y =** 0

$y = (x - 6)(x - 3)$

$0 = (x - 6)(x - 3)$

1st zero

$0 = x - 6$

$6 = x$

2nd zero

$0 = x - 3$

$3 = x$

CABILAN MATH ONLINE.COM

Homework:

Page 333 – 335

#1, 2, 4, 6

CABILAN MATH ONLINE.COM