ST. JEAN DE BREBEUF MATHEMATICS

CHAPTER 6.3

KEY FEATURES OF QUADRATIC RELATIONS

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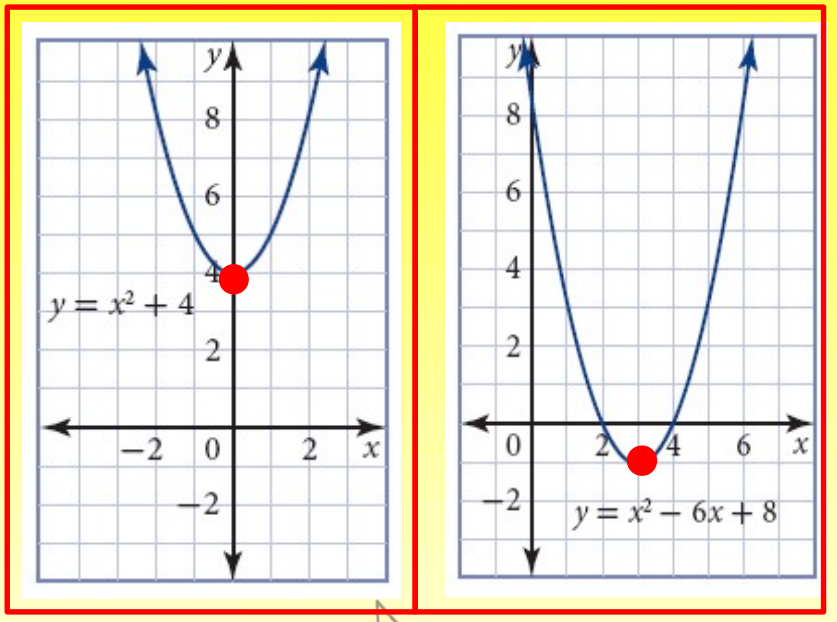
KEY CONCEPTS

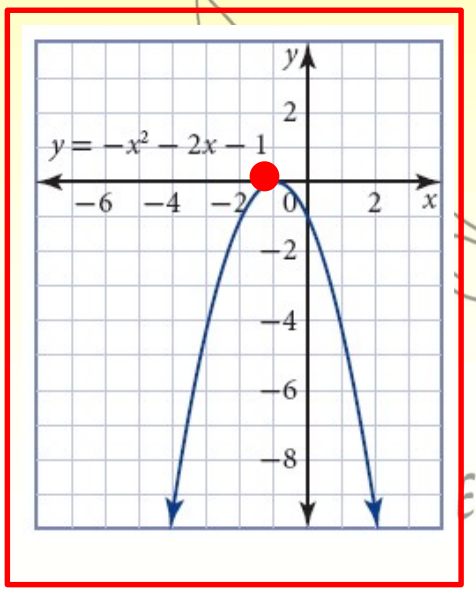
For a quadratic relation in the form $\mathbf{y = ax^2 + bx + c}$, where $\mathbf{a \neq 0}$

If the *a* value is positive, the parabola opens upward and has a **minimum** value.
If the *a* value is negative, the parabola opens downward and has a **maximum** value.

The **vertex** of a parabola is the point at which the parabola changes from decreasing to increasing or from increasing to decreasing.

The **maximum** or **minimum** value is the *y*-coordinate of the vertex.





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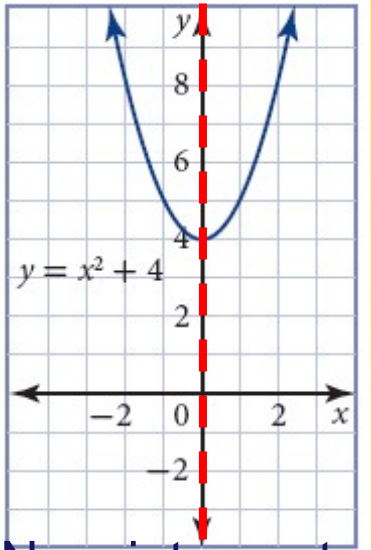
KEY CONCEPTS

The **axis of symmetry** is the vertical line that passes through the vertex.
→ the equation of the axis of symmetry is $x = p$, where p is the x-coordinate of the vertex

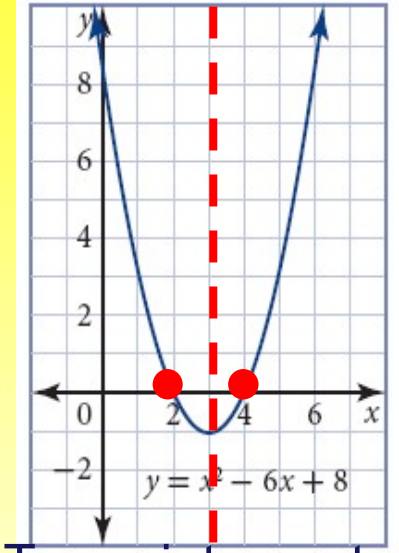
The ***x*-intercepts** are the x-coordinates of the points at which the parabola crosses the x-axis.
→ A parabola may have **zero**, **one**, or **two** x-intercepts.

x = 0



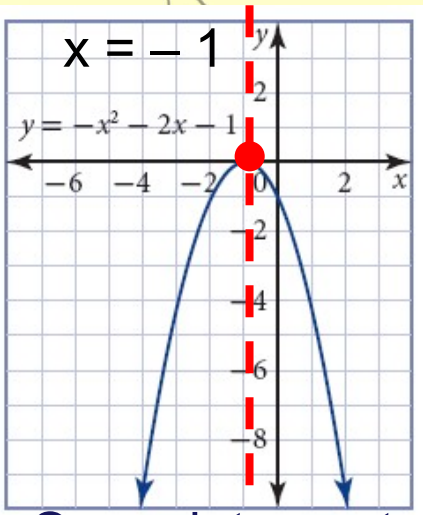
No x-intercepts

x = 3



Two x-intercepts

x = – 1

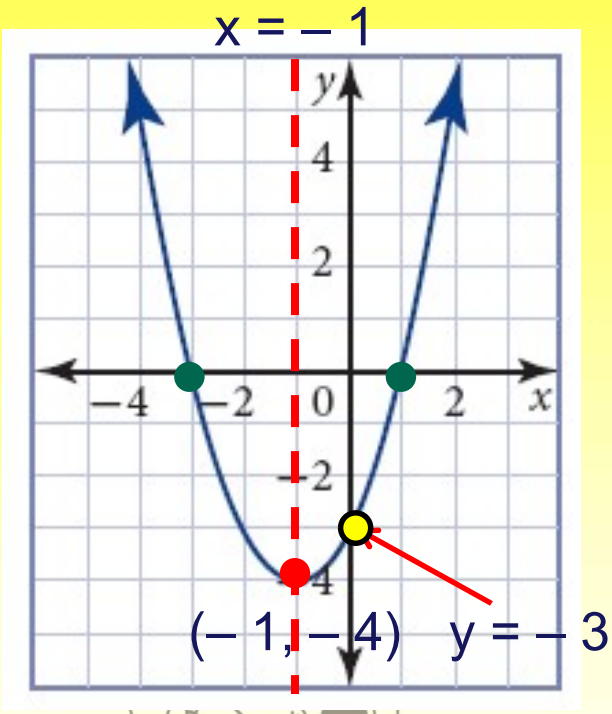


One x-intercept

CHAPTER 6.3 KEY FEATURES OF QUADRATIC RELATIONS

EXAMPLE 1

Identifying Features of a Quadratic Relation, Graph Given



(a) For the graph on the *right*,

1. Identify the **coordinates** of the vertex (– 1, – 4)

2. The equation of **axis of symmetry** x = – 1

3. The **y-intercept** y = – 3

4. (a) Is it a **minimum** or **maximum**?
   Parabola opens up → **Minimum**
   (b) What is the value? y = – 4

5. (a) How many **x-intercepts**? 2
   (b) What is it/what are they?
   x = – 3 and x = 1

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CHAPTER 6.3 KEY FEATURES OF QUADRATIC RELATIONS

EXAMPLE 1

Identifying Features of a Quadratic Relation, Graph Given

(b) For the graph on the *right*,

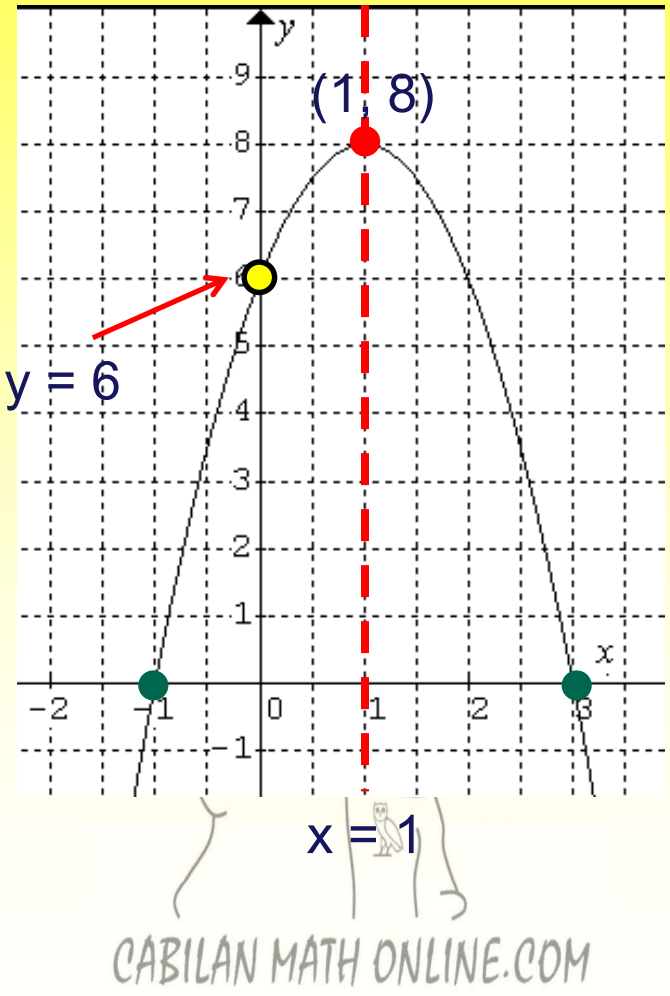
1. Identify the **coordinates** of the vertex (1, 8)

2. The equation of **axis of symmetry** x = 1

3. The **y-intercept** y = 6

4. (a) Is it a **minimum** or **maximum**?
   Parabola opens down → **Maximum**
   (b) What is the value? y = 8

5. (a) How many **x-intercepts**? 2
   (b) What is it/what are they?
   x = – 1 and x = 3



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CHAPTER 6.3 KEY FEATURES OF QUADRATIC RELATIONS

EXAMPLE 2 *Key Features of a Quadratic Relation, Equation Given*

A quadratic relation is given by the equation $\mathbf{y = x^2 - 2x + 3}$.

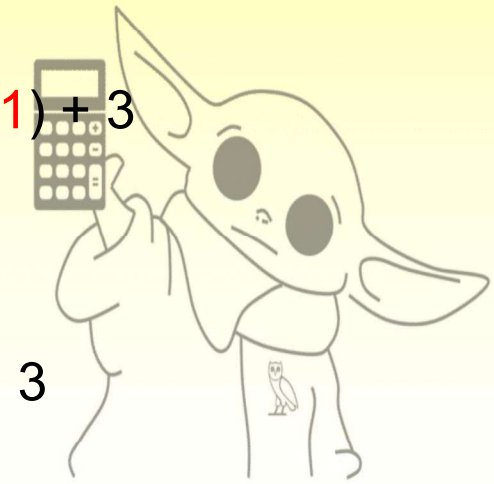
1. Complete the table of values then graph the data.

x	y
– 2	11
– 1	6
0	3
1	
2	

$y = x^2 - 2x + 3$
$= (-2)^2 - 2(-2) + 3$
$= \mathbf{11}$

$y = x^2 - 2x + 3$
$= (-1)^2 - 2(-1) + 3$
$= \mathbf{6}$

$y = x^2 - 2x + 3$
$= (0)^2 - 2(0) + 3$
$= \mathbf{3}$



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EXAMPLE 2 *Key Features of a Quadratic Relation, Equation Given*

A quadratic relation is given by the equation $\mathbf{y = x^2 - 2x + 3}$.

1. Complete the table of values then graph the data.

x	y
– 2	11
– 1	6
0	3
1	2
2	3

$y = x^2 - 2x + 3$
$= (1)^2 - 2(1) + 3$
$= \mathbf{2}$

$y = x^2 - 2x + 3$
$= (2)^2 - 2(2) + 3$
$= \mathbf{3}$

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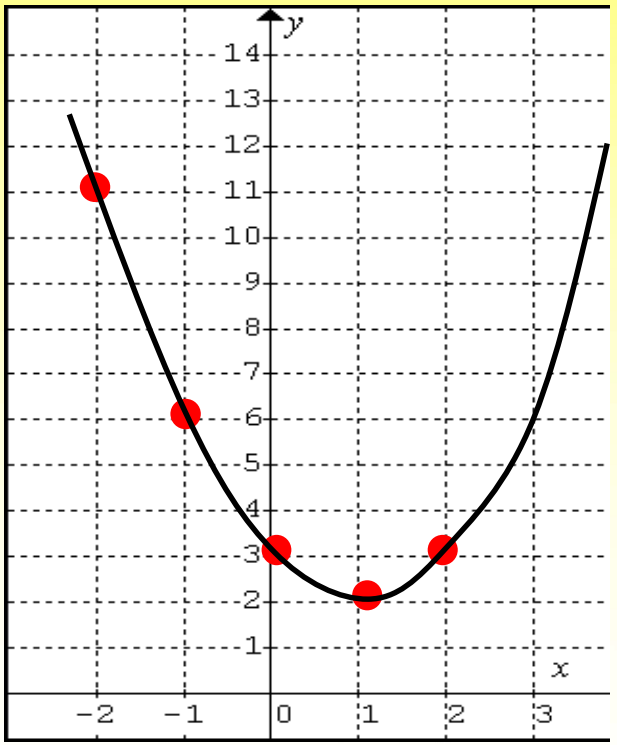
EXAMPLE 2 *Key Features of a Quadratic Relation, Equation Given*

A quadratic relation is given by the equation $\mathbf{y = x^2 - 2x + 3}$.

1. Complete the table of values then graph the data.

x	y	
– 2	11	(– 2, 11)
– 1	6	(– 1, 6)
0	3	(0, 3)
1	2	(1, 2)
2	3	(2, 3)



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CHAPTER 6.3 KEY FEATURES OF QUADRATIC RELATIONS

EXAMPLE 2 *Key Features of a Quadratic Relation, Equation Given*

A quadratic relation is given by the equation $\mathbf{y = x^2 - 2x + 3}$.

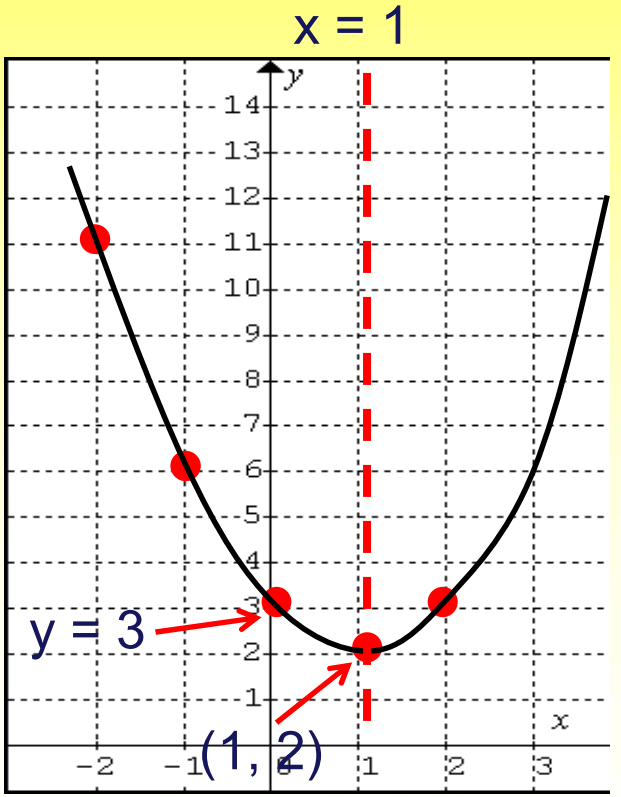
2. Identify the **coordinates** of the vertex
(1, 2)

3. The equation of **axis of symmetry** x = 1

4. The **y-intercept** y = 3

5. (a) Is it a **minimum** or **maximum**?
Parabola opens up → **Minimum**
(b) What is the value?
y = 2

6. (a) How many **x-intercepts**? None
(b) What is it/what are they?
None



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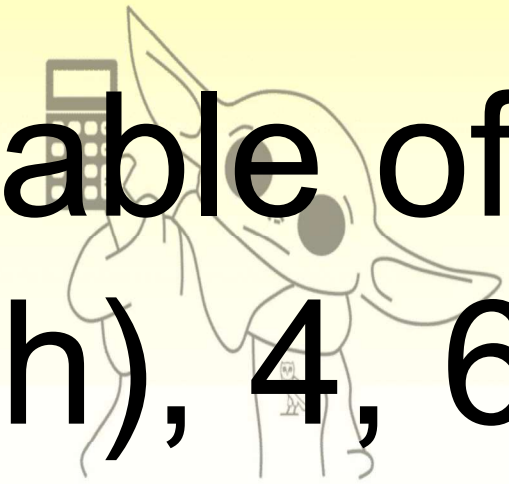
Homework:

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#1, 3 (create a table of values and graph), 4, 6