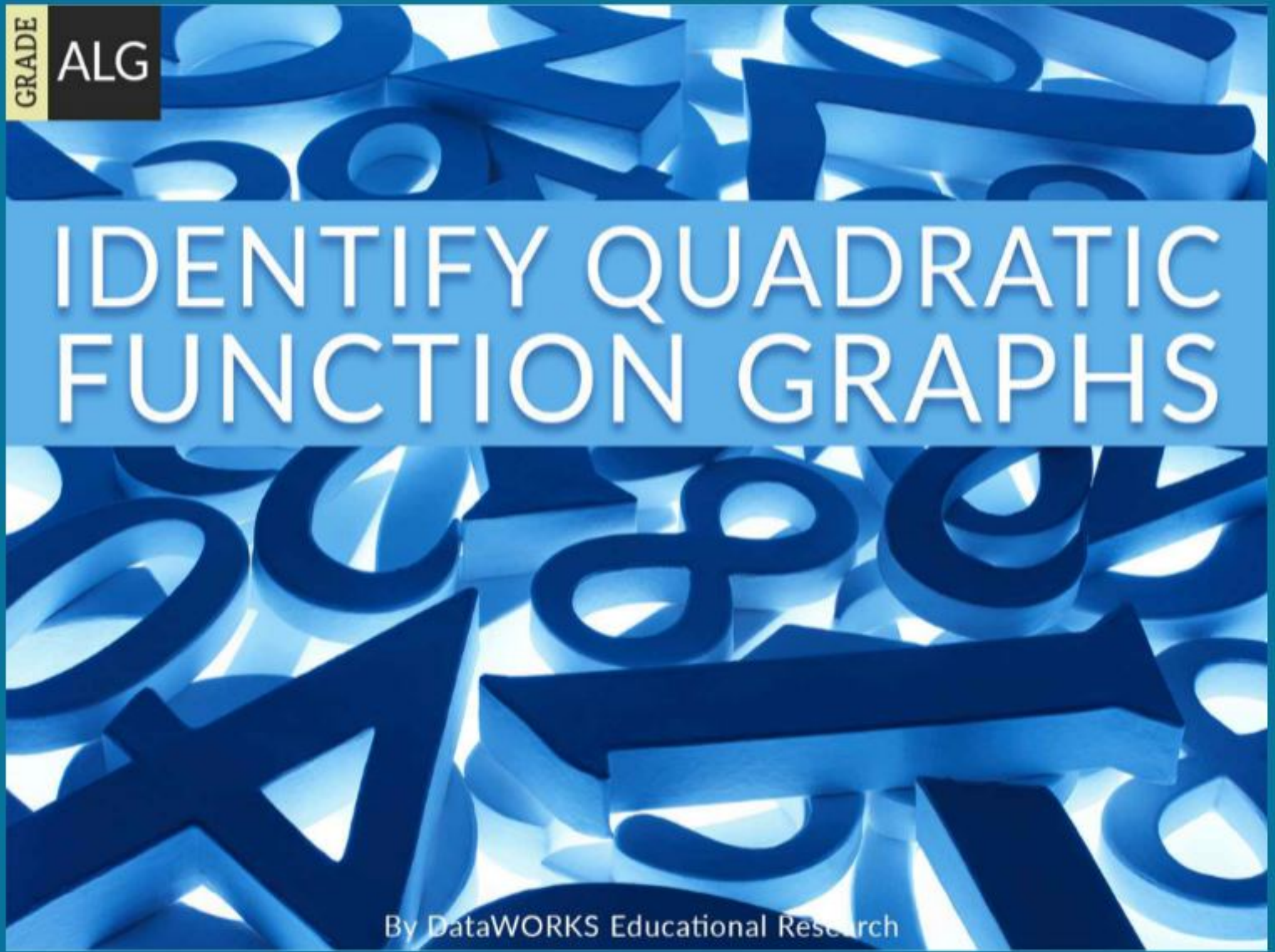
GRADE ALG

IDENTIFY QUADRATIC FUNCTION GRAPHS



By DataWORKS Educational Research

Learning Objective

Today, we will identify[1] quadratic function graphs.

Activate Prior Knowledge

A **coefficient** is a number that is multiplied to a variable.
The ***y*-intercept** is the point where a line crosses the *y*-axis.

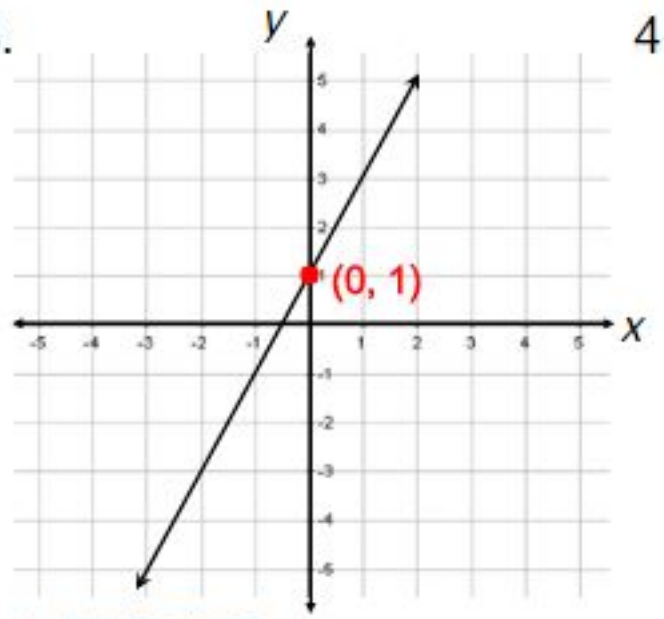
Identify the coefficient of the following terms.

1. $-3x^2$

2. $5x^2$

Identify the *y*-intercept of the following graphs.

3.



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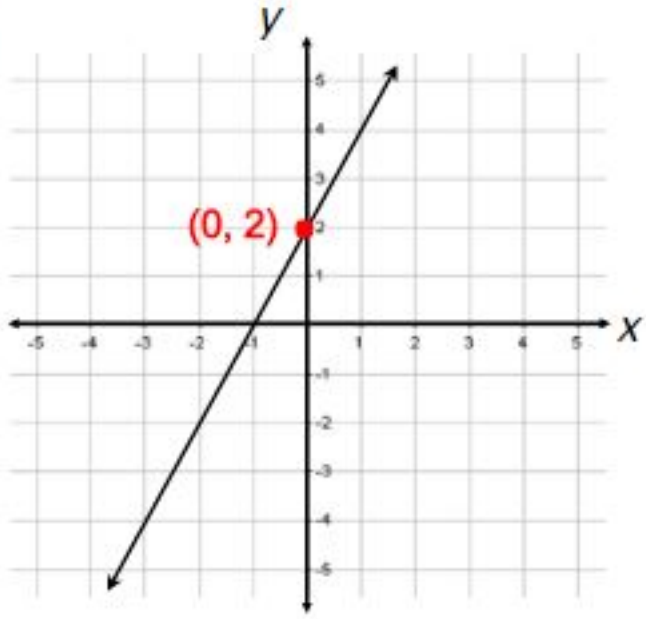


CFU

What are we going to do today?

What does *identify* mean?
Identify means _____.

Make Connection

Students, you already know how to identify coefficients and y-intercepts. Today, we will use coefficients and y-intercepts to identify the graphs of quadratic functions.

Vocabulary

[1] find and name

A quadratic function graphs as a **parabola**.

- ***A quadratic function*** *can be written in the form* $y = ax^2 + bx + c$, *where* $a \neq 0$.

The coefficient of x^2 declares the **direction** and width of the parabola.

The constant declares the ***y*-intercept** of the parabola.

Quadratic Functions

$y = x^2 + 5x + 7$

$y = 3x^2 - 7$

$y = 4x^2$

$$y = ax^2 + c$$

Parabolas

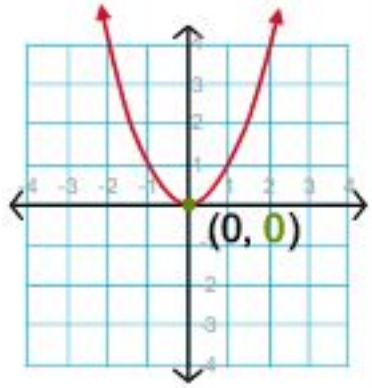
If ***a*** is **positive** then the parabola opens upward.

If $|a| < 1$ then the parabola will be wide.

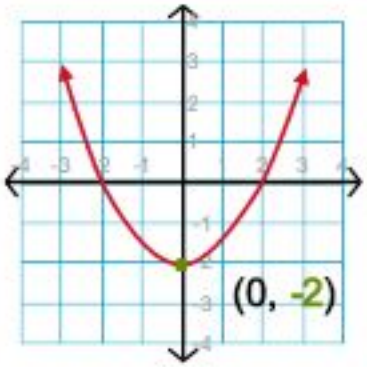
If **a** is **negative** then the parabola opens downward.

If $|a| > 1$ then the parabola will be narrow.

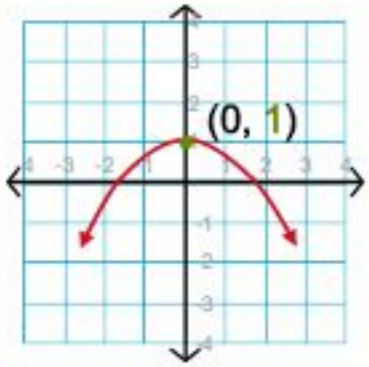
$y = x^2$



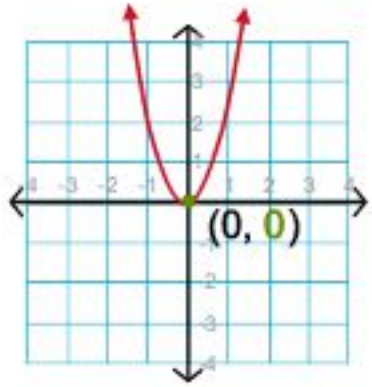
$y = \frac{1}{2}x^2 - 2$



$y = -\frac{1}{3}x^2 + 1$



$y = 2x^2 + 0$



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Which words best describe the direction of the parabola for the quadratic function $y = -4x^2 + 5$? How do you know?

A Opens Upward

B Opens Downward

Which word best describes the width of the parabola for the quadratic function $y = 3x^2 - 2$? How do you know?

A Wide

B Narrow

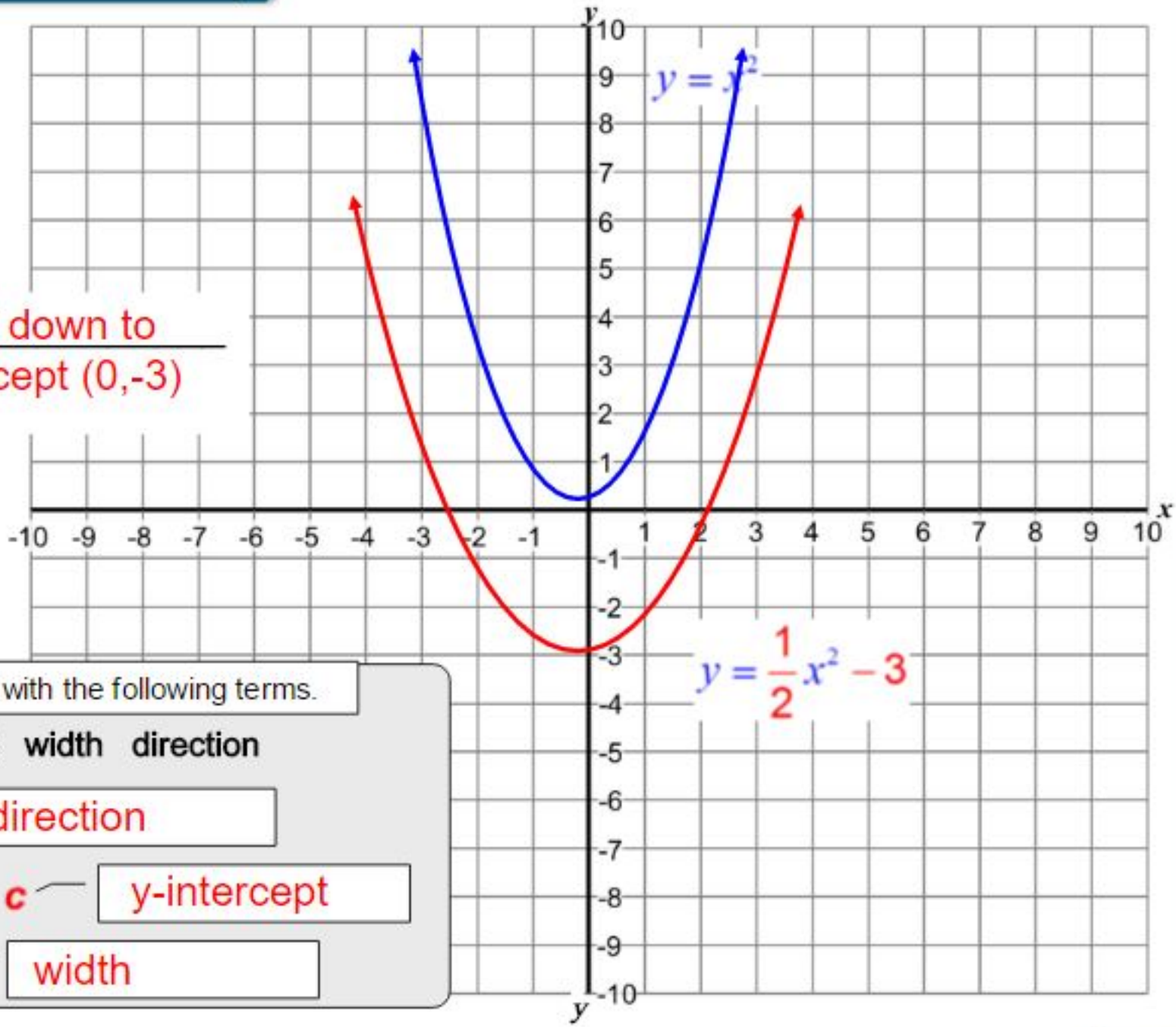
How do you know the point (0, 1) is the *y*-intercept for the quadratic function $y = -\frac{1}{3}x^2 + 1$?

Vocabulary

[2] tells

$y = \frac{1}{2}x^2 - 3$

Parabola shifted down to
y-intercept (0,-3)



Fill in the blanks with the following terms.

y-intercept width direction

$y = \pm ax^2 + c$

- direction
- y-intercept
- width

Skill Development/Guided Practice

A quadratic function graphs as a **parabola**.
The **coefficient** of x^2 declares the **direction** and width of the parabola.
The **constant** declares the ***y*-intercept** of the parabola.

direction
$y = \pm ax^2 + c$ ← *y*-intercept
width

Identify quadratic function graphs.

1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine[3] the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

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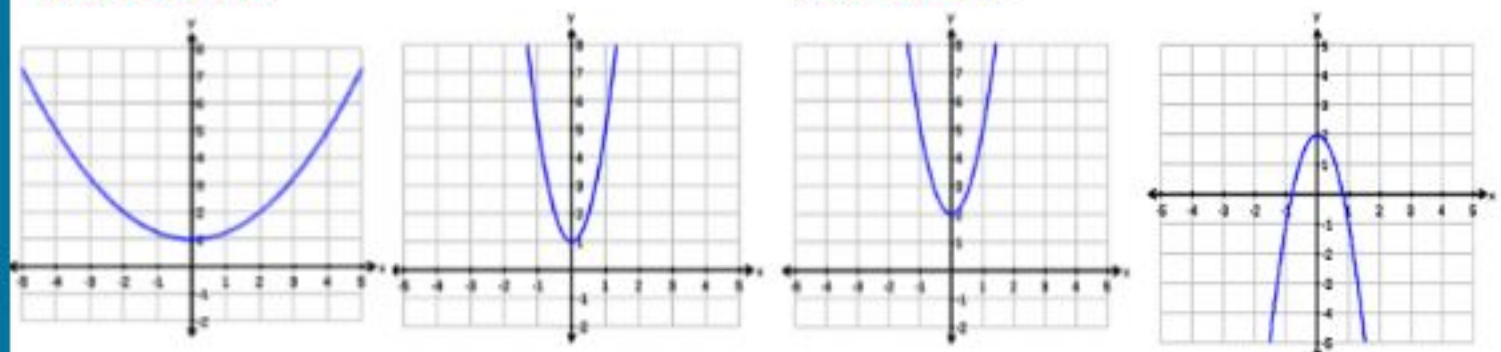
2. How did I/you determine the direction and width of the parabola?
3. How did I/you determine the *y*-intercept of the parabola?
4. How did I/you identify the graph of the quadratic function?

1. $y = \overset{a}{3}x^2 + \overset{c}{2}$

Direction: upward Width: narrow
y-intercept: (0, 2)
The graph of the quadratic function is Parabola C.

2. $y = \overset{a}{4}x^2 + \overset{c}{1}$

Direction: upward Width: narrow
y-intercept: (0, 1)
The graph of the quadratic function is Parabola B.



A B C D

Vocabulary

[3] figure out

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

$$y = \pm ax^2 + c$$

direction; width; a: width; c: *y*-intercept

Identify quadratic function graphs.

1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
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CFU

2. How did I/you determine the direction and width of the parabola?
3. How did I/you determine the *y*-intercept of the parabola?
4. How did I/you identify the graph of the quadratic function?

a *c*

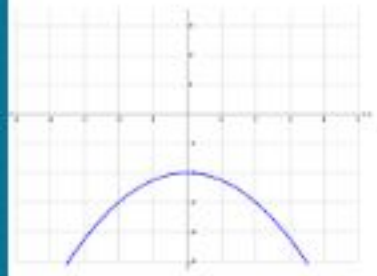
3. $y = \frac{1}{4}x^2 - 2$

Direction: upward Width: wide
y-intercept: (0, -2)
The graph of the quadratic function is Parabola C.

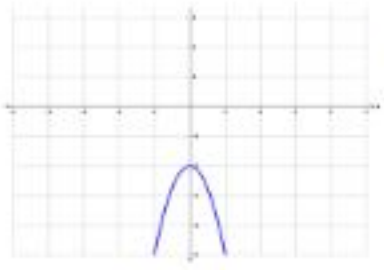
a *c*

4. $y = \frac{1}{4}x^2 + 1$

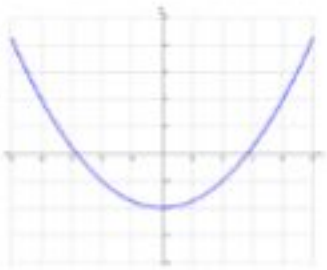
Direction: upward Width: wide
y-intercept: (0, 1)
The graph of the quadratic function is Parabola D.



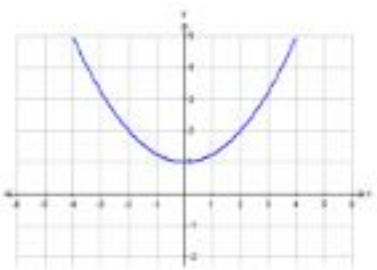
A



B



C



D

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

$$y = \pm ax^2 + c$$

direction; width; c ← *y*-intercept

Identify quadratic function graphs.

1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

CFU

2. How did I/you determine the direction and width of the parabola?
3. How did I/you determine the *y*-intercept of the parabola?
4. How did I/you identify the graph of the quadratic function?

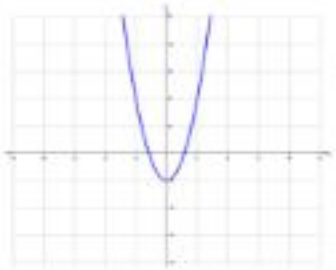
5. $y = -3x^2 - 1$ ($a = -3$, $c = -1$)

Direction: downward Width: narrow
y-intercept: (0, -1)
The graph of the quadratic function is Parabola A.

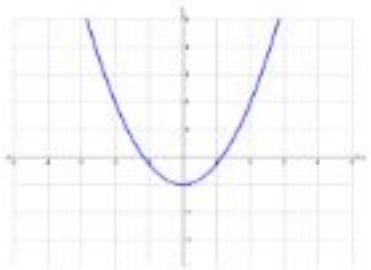
6. $y = -4x^2 + 2$ ($a = -4$, $c = 2$)

Direction: downward Width: narrow
y-intercept: (0, 2)
The graph of the quadratic function is Parabola D.

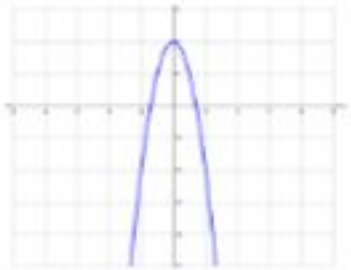
A



B



C



D

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

direction
$y = \pm ax^2 + c$ ← *y*-intercept
width

Identify quadratic function graphs.

1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
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CFU

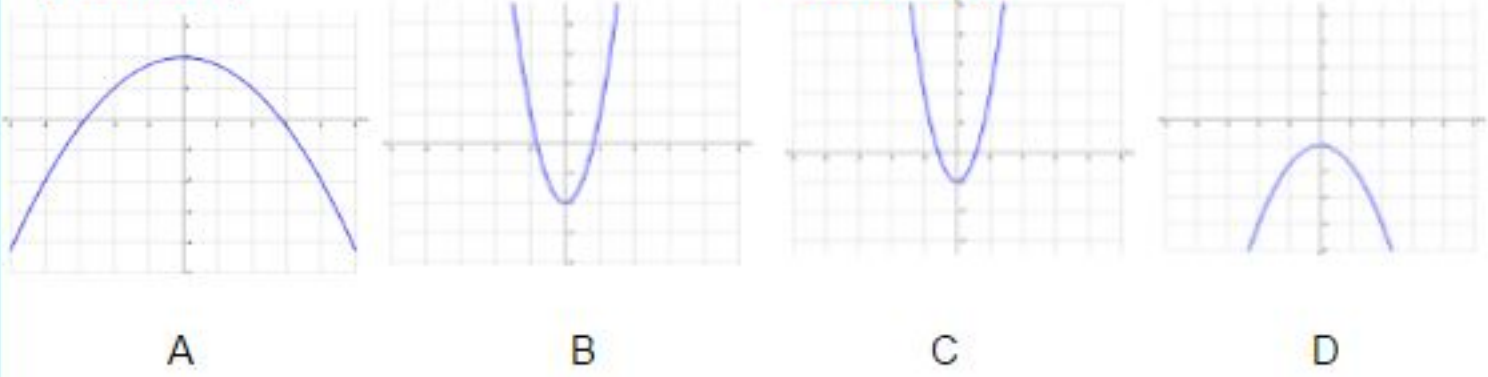
2. How did I/you determine the direction and width of the parabola?
3. How did I/you determine the *y*-intercept of the parabola?
4. How did I/you identify the graph of the quadratic function?

7. $y = -\frac{3}{4}x^2 - 1$ (*a* = $-\frac{3}{4}$, *c* = −1)

Direction: downward Width: wide
y-intercept: (0, -1)
The graph of the quadratic function is Parabola D.

8. $y = -\frac{1}{4}x^2 + 2$ (*a* = $-\frac{1}{4}$, *c* = 2)

Direction: downward Width: wide
y-intercept: (0, 2)
The graph of the quadratic function is Parabola A.

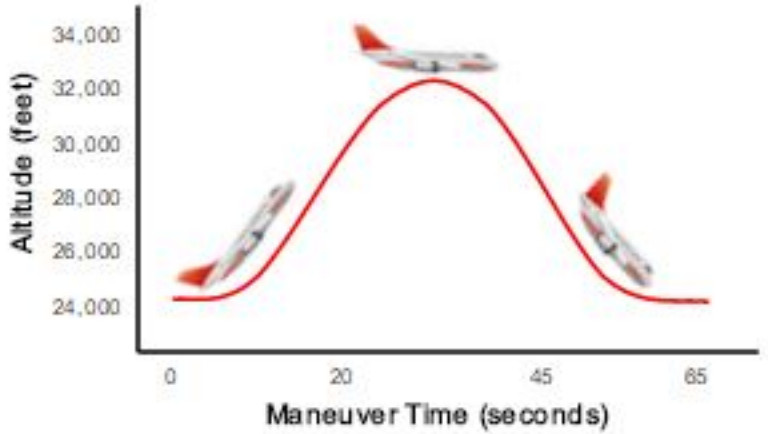


A B C D

A quadratic function graphs as a **parabola**.
The **coefficient** of x^2 declares the **direction** and width of the parabola.
The **constant** declares the ***y*-intercept** of the parabola.

1 *Identifying graphs of quadratic functions will help you understand graphs in the real world.*

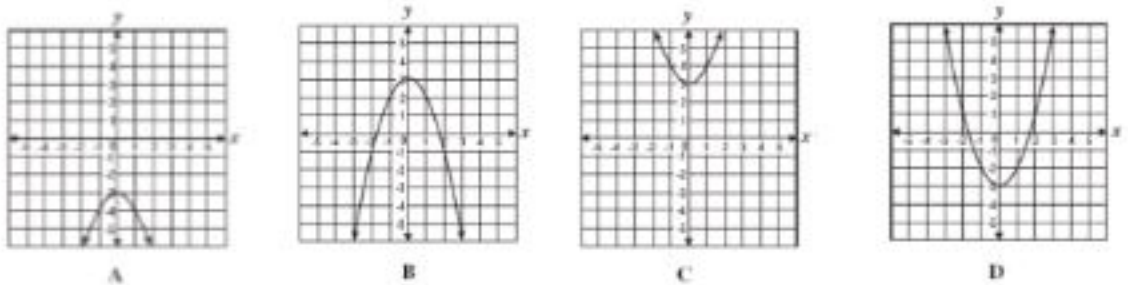
The "Weightless Wonder" is a plane used by NASA to train astronauts in zero-gravity situations. It accelerates upward and then descends fast enough for the effects of gravity to be negated, producing a feeling of weightlessness.



2 *Identifying graphs of quadratic functions will help you do well on tests.*

Sample Test Question:

70 Which *best* represents the graph of $y = -x^2 + 3$?



CFU

Does anyone else have another reason why it is relevant to identify quadratic function graphs? (pair-share) Why is it relevant to identify quadratic function graphs? You may give me one of my reasons or one of your own. Which reason is more relevant to you? Why?

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

direction
$y = \pm ax^2 + c$ ← *y*-intercept
width

Skill Closure

Identify quadratic function graphs.

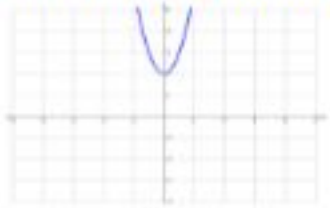
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

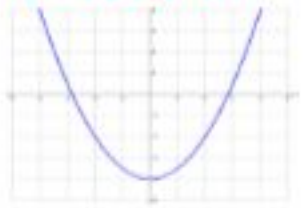
1. $y = \overset{a}{4}x^2 + \overset{c}{2}$

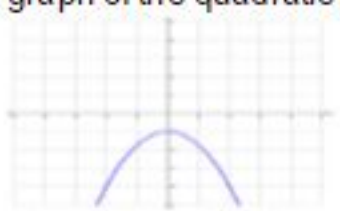
Direction: upward Width: narrow
y-intercept: (0, 2)
The graph of the quadratic function is Parabola A.

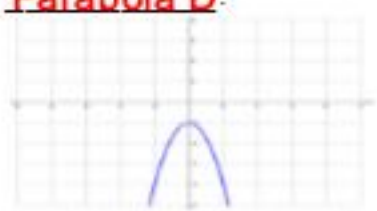
2. $y = \overset{a}{-3}x^2 - \overset{c}{1}$

Direction: downward Width: narrow
y-intercept: (0, -1)
The graph of the quadratic function is Parabola D.

A 

B 

C 

D 

Constructed Response Closure

$$y = 5x^2 - 3$$

Describe the graph of the quadratic function above.
Hint: Use the words parabola, direction, width, and y-intercept.

Summary Closure

What did you learn today identifying quadratic function graphs? (pair-share)

Independent Practice

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

$$y = \pm ax^2 + c$$

direction → $\pm a$; c → *y*-intercept; width → a

Identify quadratic function graphs.

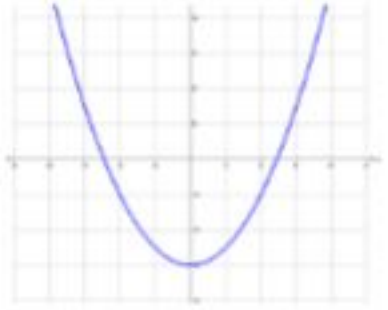
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

1. $y = \overset{a}{3}x^2 + \overset{c}{1}$

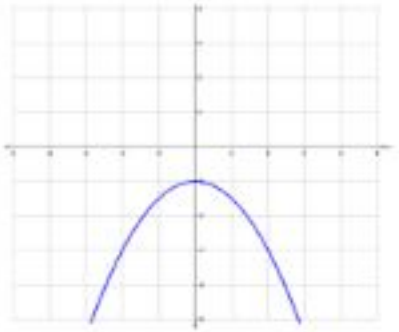
Direction: upward Width: narrow
y-intercept: (0, 1)
The graph of the quadratic function is Parabola D.

2. $y = \overset{a}{\frac{1}{2}}x^2 \overset{c}{-3}$

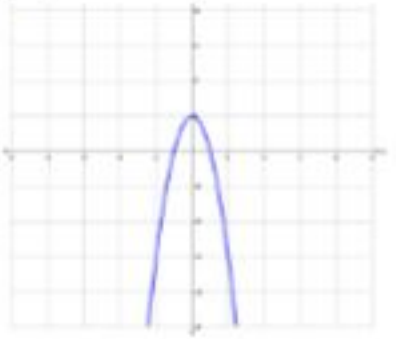
Direction: upward Width: wide
y-intercept: (0, -3)
The graph of the quadratic function is Parabola A.



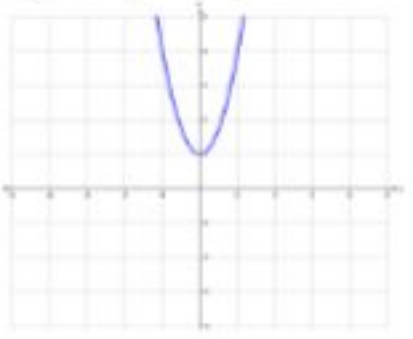
A



B



C



D

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

direction
$y = \pm ax^2 + c$ ← *y*-intercept
width

Identify quadratic function graphs.

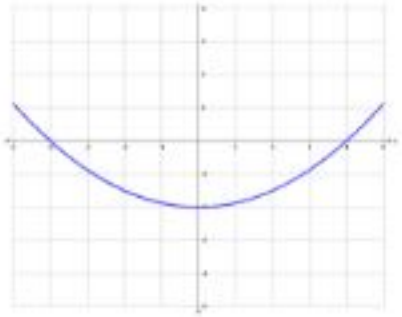
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

3. $y = -5x^2 - 3$ (*a* = -5, *c* = -3)

Direction: downward Width: narrow
y-intercept: (0, -3)
The graph of the quadratic function is Parabola B.

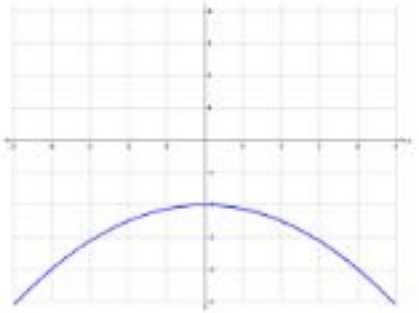
4. $y = -\frac{1}{8}x^2 - 2$ (*a* = $-\frac{1}{8}$, *c* = -2)

Direction: downward Width: wide
y-intercept: (0, -2)
The graph of the quadratic function is Parabola C.

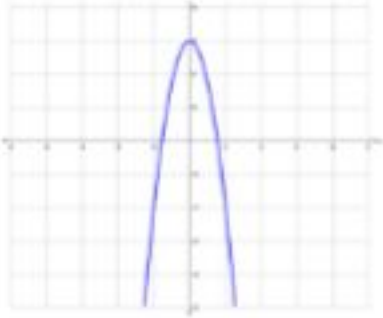


A

B



C



D

A quadratic function graphs as a **parabola**.
The **coefficient** of x^2 declares the **direction** and width of the parabola.
The **constant** declares the ***y*-intercept** of the parabola.

direction
$y = \pm ax^2 + c$ ← *y*-intercept
width

Identify quadratic function graphs.

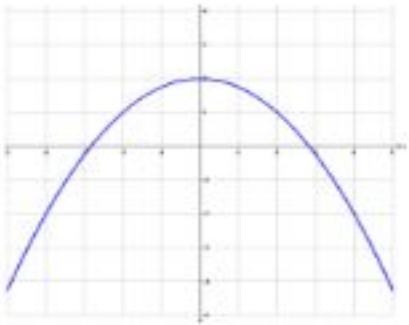
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

1. $y = 5x^2 - 1$ (*a* = 5, *c* = -1)

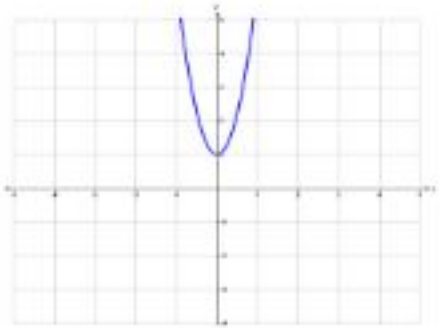
Direction: upward Width: narrow
y-intercept: (0, -1)
The graph of the quadratic function is Parabola D.

2. $y = -\frac{1}{4}x^2 + 2$ (*a* = $-\frac{1}{4}$, *c* = 2)

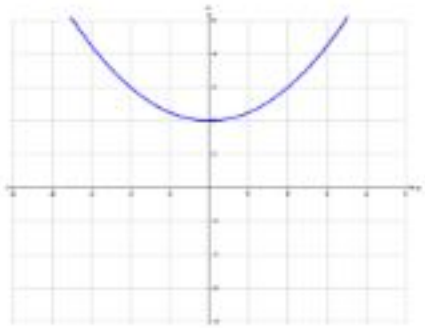
Direction: downward Width: wide
y-intercept: (0, 2)
The graph of the quadratic function is Parabola A.



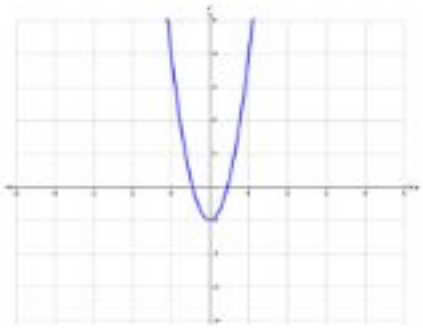
A



B



C



D

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

$$y = \pm ax^2 + c$$

direction; width; *y*-intercept

Identify quadratic function graphs.

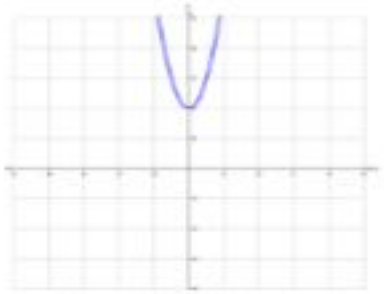
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

3. $y = \overset{a}{\frac{3}{4}}x^2 \overset{c}{-4}$

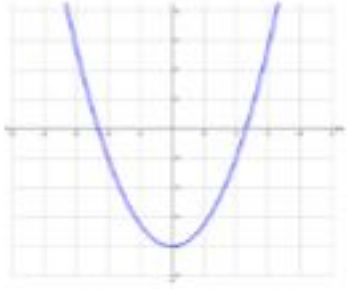
Direction: upward Width: wide
y-intercept: (0, -4)
The graph of the quadratic function is Parabola B.

4. $y = \overset{a}{-7}x^2 \overset{c}{+2}$

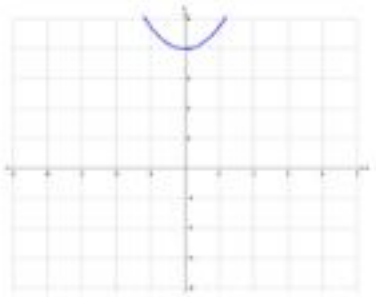
Direction: downward Width: narrow
y-intercept: (0, 2)
The graph of the quadratic function is Parabola D.



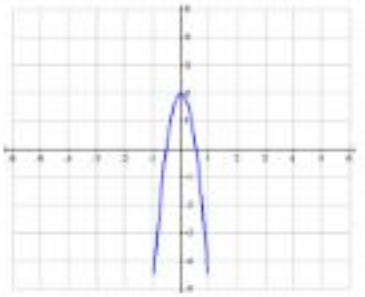
A



B



C



D

A quadratic function graphs as a **parabola**.
The **coefficient** of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

direction
$y = \pm \mathbf{a}x^2 + \mathbf{c}$ ← *y*-intercept
width

Identify quadratic function graphs.

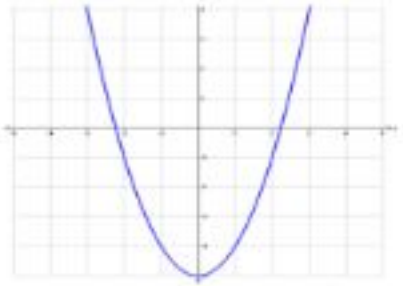
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

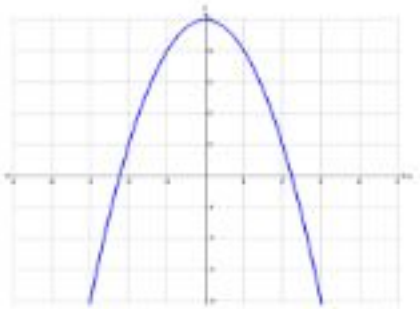
1. $y = \overset{a}{1}x^2 \overset{c}{-5}$

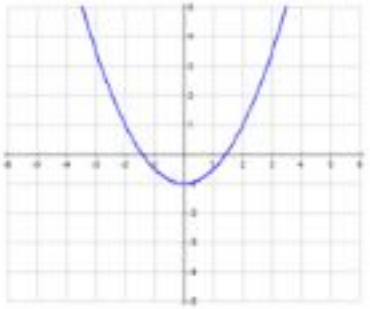
Direction: upward Width: normal
y-intercept: (0, -5)
The graph of the quadratic function is Parabola A.

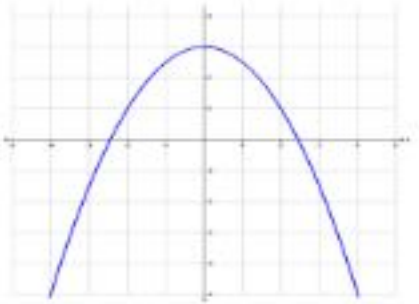
2. $y = -\frac{1}{2}x^2 + 3$ (*a* = $-\frac{1}{2}$, *c* = 3)

Direction: downward Width: wide
y-intercept: (0, 3)
The graph of the quadratic function is Parabola D.

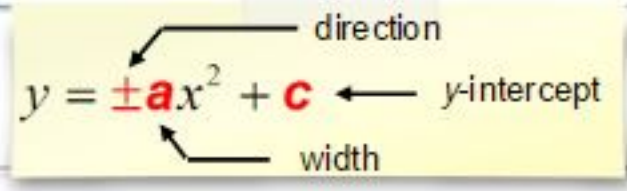

A


B


C


D

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.



Identify quadratic function graphs.

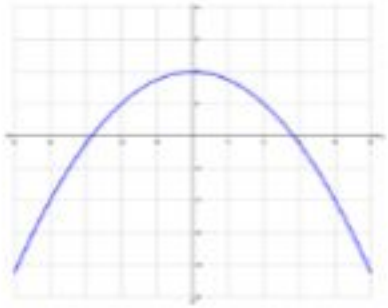
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

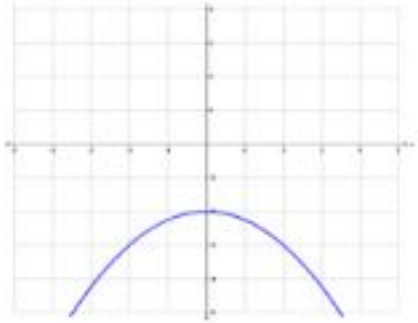
3. $y = \overset{a}{2}x^2 + \overset{c}{1}$

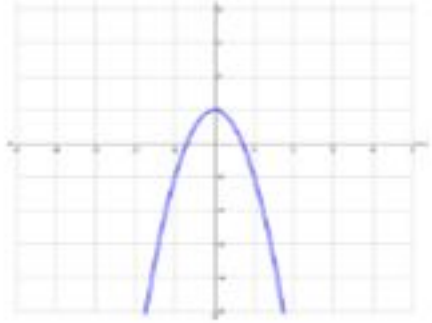
Direction: upward Width: narrow
y-intercept: (0, 1)
The graph of the quadratic function is Parabola D

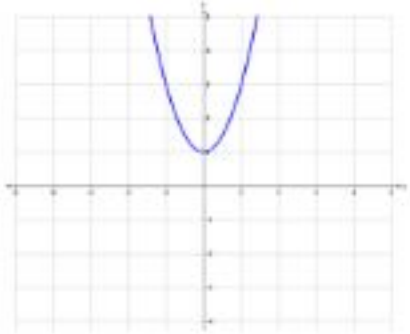
4. $y = \overset{a}{-2}x^2 + \overset{c}{1}$

Direction: downward Width: narrow
y-intercept: (0, 1)
The graph of the quadratic function is Parabola C


A


B


C


D

A quadratic function graphs as a **parabola**.
The coefficient of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

$$y = \pm ax^2 + c$$

direction; width; a: width; c: *y*-intercept

Identify quadratic function graphs.

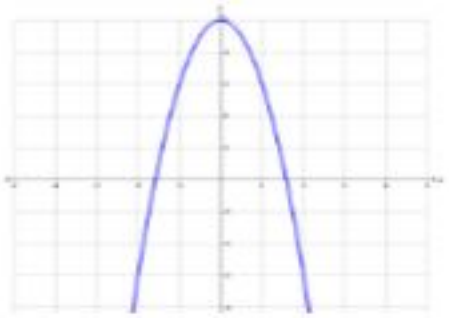
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

1. $y = \overset{a}{2}x^2 \overset{c}{-5}$

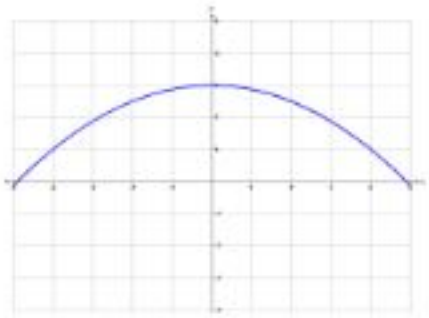
Direction: upward Width: narrow
y-intercept: (0, -5)
The graph of the quadratic function is Parabola D.

2. $y = -\frac{1}{8}x^2 + 3$ (a, c)

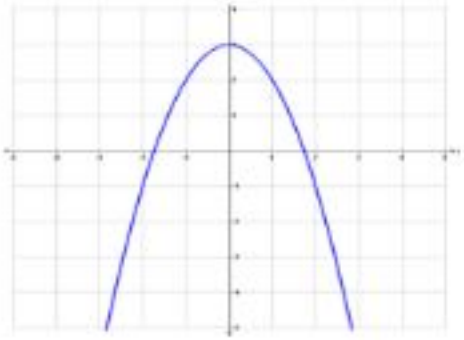
Direction: downward Width: wide
y-intercept: (0, 3)
The graph of the quadratic function is Parabola B



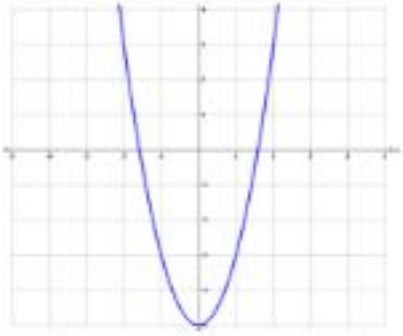
A



B



C



D

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A quadratic function graphs as a **parabola**.
The **coefficient** of x^2 declares the **direction** and width of the parabola.
The constant declares the ***y*-intercept** of the parabola.

direction
$y = \pm ax^2 + c$ ← *y*-intercept
width

Identify quadratic function graphs.

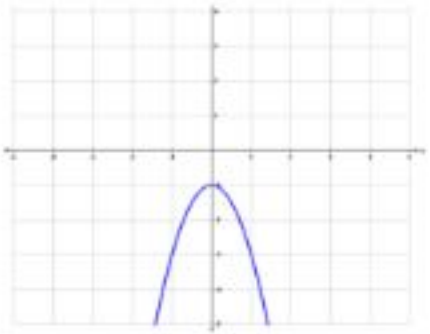
1. Identify the coefficient (***a***) and constant (***c***) of the quadratic function. (label)
2. Determine the **direction** and **width** of the parabola.
3. Determine the ***y*-intercept** of the parabola.
4. Identify the graph of the quadratic function.

3. $y = -2x^2 - 1$ (*a* = -2, *c* = -1)

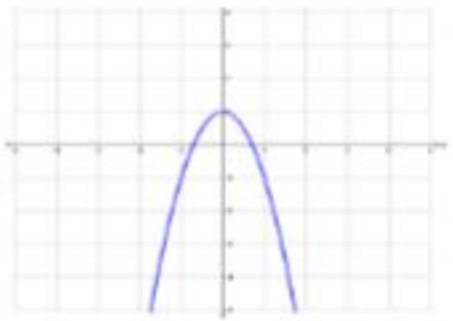
Direction: downward Width: narrow
y-intercept: (0, -1)
The graph of the quadratic function is Parabola A.

4. $y = \frac{1}{4}x^2 + 1$ (*a* = $\frac{1}{4}$, *c* = 1)

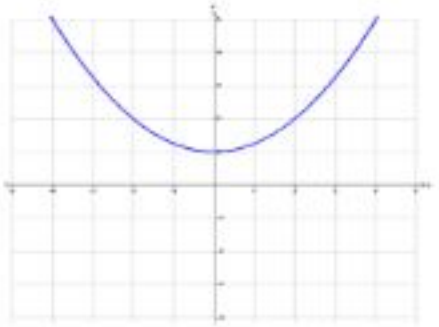
Direction: upward Width: wide
y-intercept: (0, 1)
The graph of the quadratic function is Parabola C.



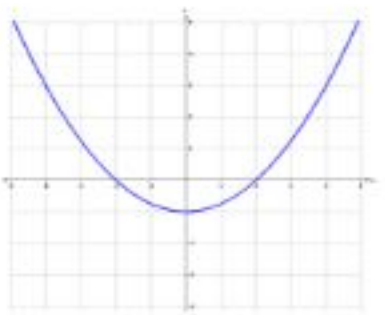
A



B



C



D