



THIRD SPACE  
LEARNING

# Diagnostic Questions

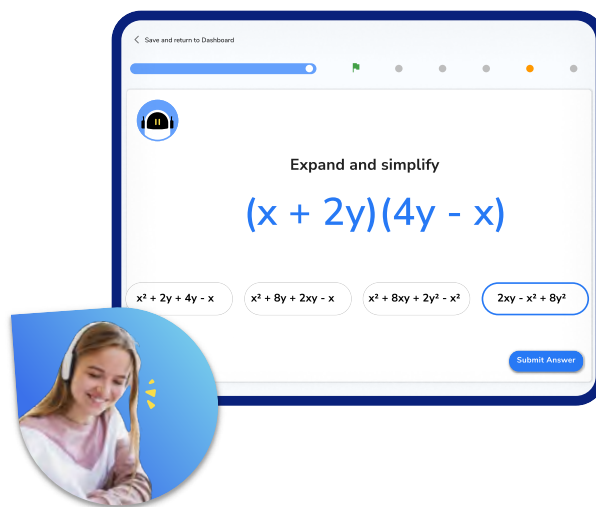
Quadratic Graphs | Algebra

## This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **Quadratic Graphs** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

## How to use the questions in this resource

There are 15 multiple choice questions, each designed to assess each of the key skills required to master **quadratic graphs**. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Substitution**, **Reading scales**, **Negative numbers**, **Sketching graphs**, and **Coordinates**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

## Diagnostic Questions: Quadratic Graphs

1. If  $x = 3$  find the value of  $y$  on the quadratic graph with equation:

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

A) 31	B) 1
C) - 2	D) - 13

2. If  $x = -4$  find the value of  $y$  on the quadratic graph with equation:

$$y = x^2 + 3x - 9$$

A) - 37	B) 19
C) 13	D) - 5

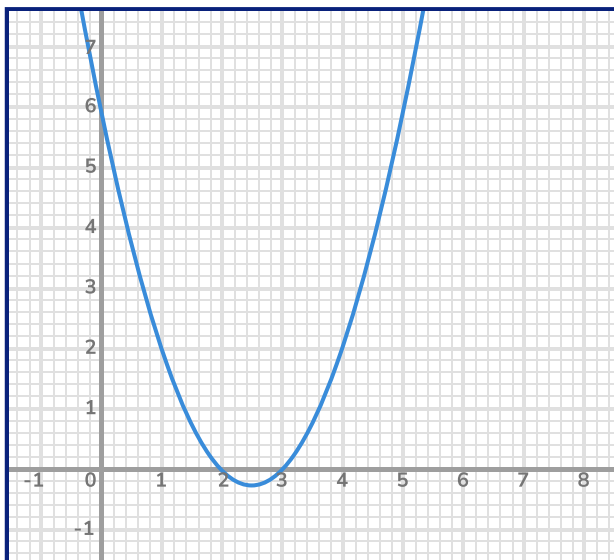
3. If  $x = -1$  find the value of  $y$  on the quadratic graph with equation:

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

A) 1	B) - 1
C) 5	D) - 5

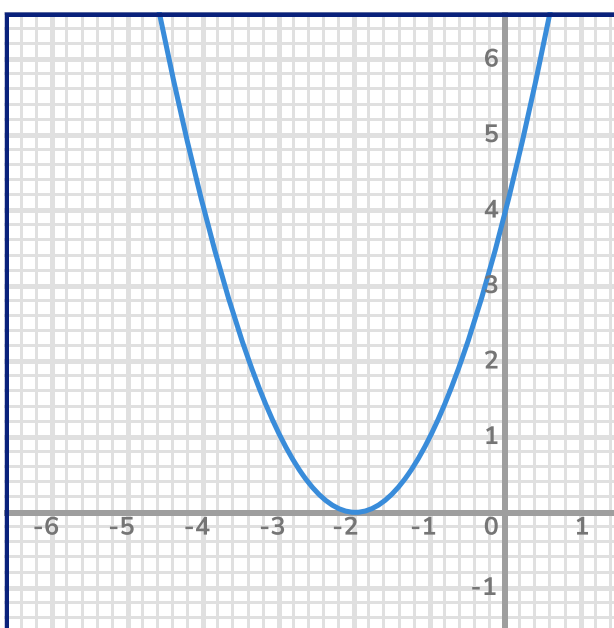
## Diagnostic Questions: Quadratic Graphs

4. Using this graph of  $y = x^2 - 5x + 6$ , solve the equation  $x^2 - 5x + 6 = 0$



A) $x = 6$	B) $x = 2$
C) $x = 2$ or $x = 3$	D) $x = 3$

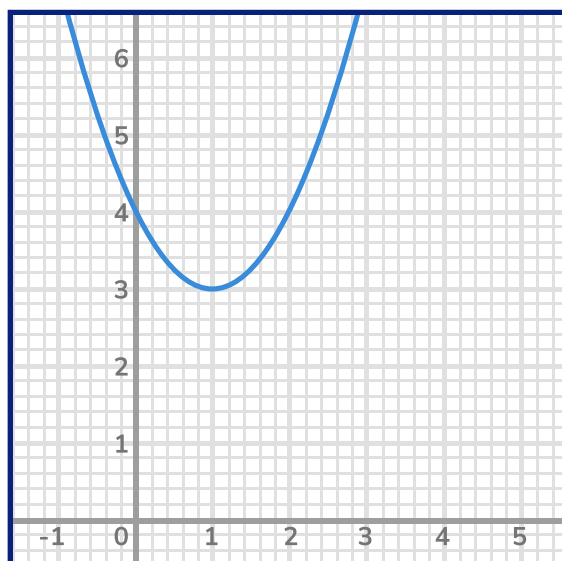
5. Using this graph of  $y = x^2 + 4x + 4$ , solve the equation  $x^2 + 4x + 4 = 0$



A) $x = -2$	B) $x = 2$
C) $x = 4$	D) $x = 0$

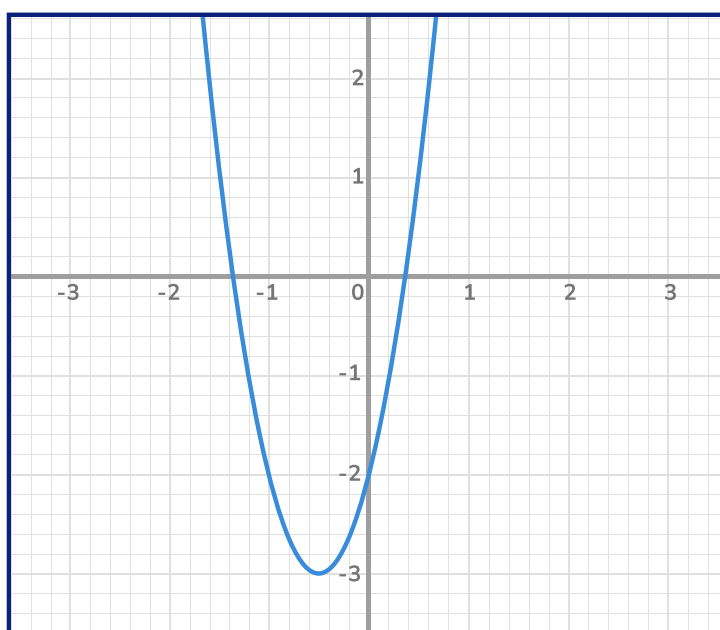
## Diagnostic Questions: Quadratic Graphs

6. Using this graph of  $y = x^2 - 2x + 4$ , find the coordinates of the turning point:



A) (1, 3)	B) (3, 1)
C) (0, 4)	D) (-2, 4)

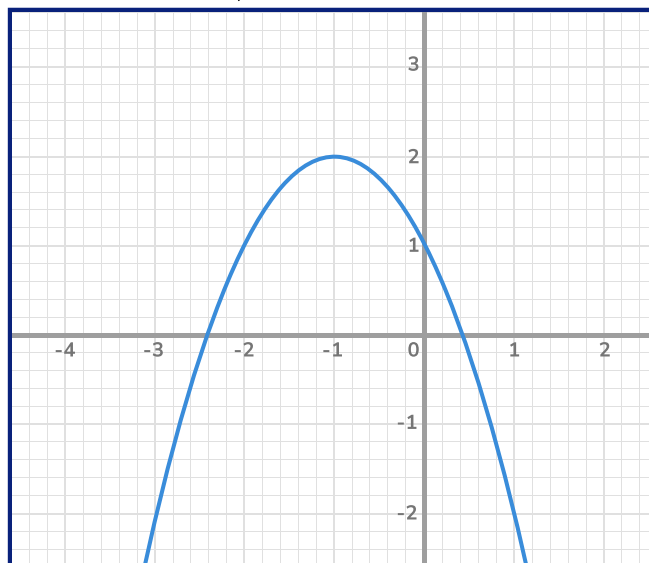
7. Using this graph of  $y = 4x^2 + 4x - 2$ , find the coordinates of the turning point:



A) (0, -2)	B) (-3, -0.5)
C) (-1.3, 0.3)	D) (-0.5, -3)

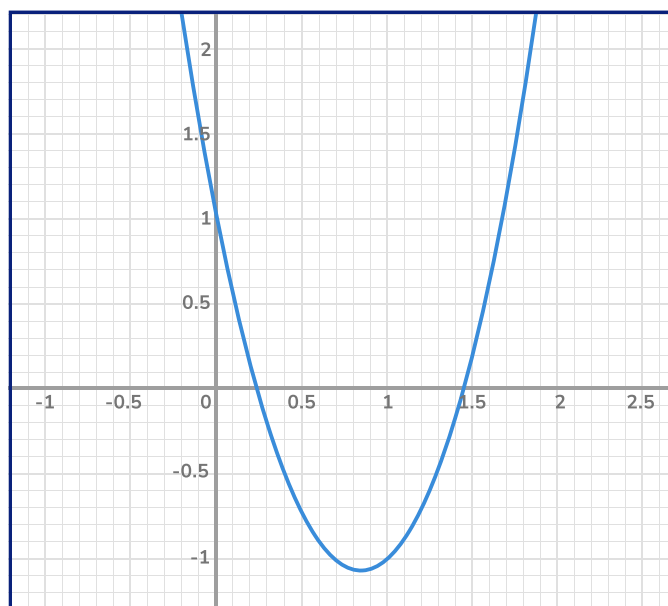
## Diagnostic Questions: Quadratic Graphs

8. Using this graph of  $y = 1 - 2x - x^2$ , find the coordinates of the turning point:



A) (1, 2)	B) (0, 1)
C) (-1, 2)	D) (2, 1)

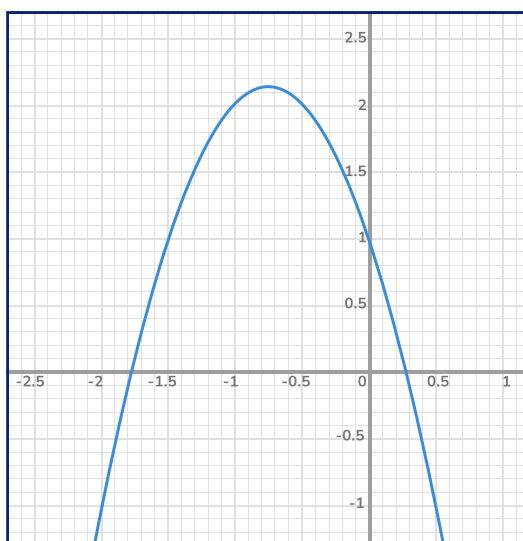
9. Use this graph of  $y = 3x^2 - 5x + 1$  to find the approximate solutions to the equation  $3x^2 + 1 = 5x$



A) $x \approx 0$ and $x \approx 1.7$	B) $x \approx 1$ and $x \approx 7$
C) $x \approx -0.2$ and $x \approx -1.4$	D) $x \approx 0.2$ and $x \approx 1.4$

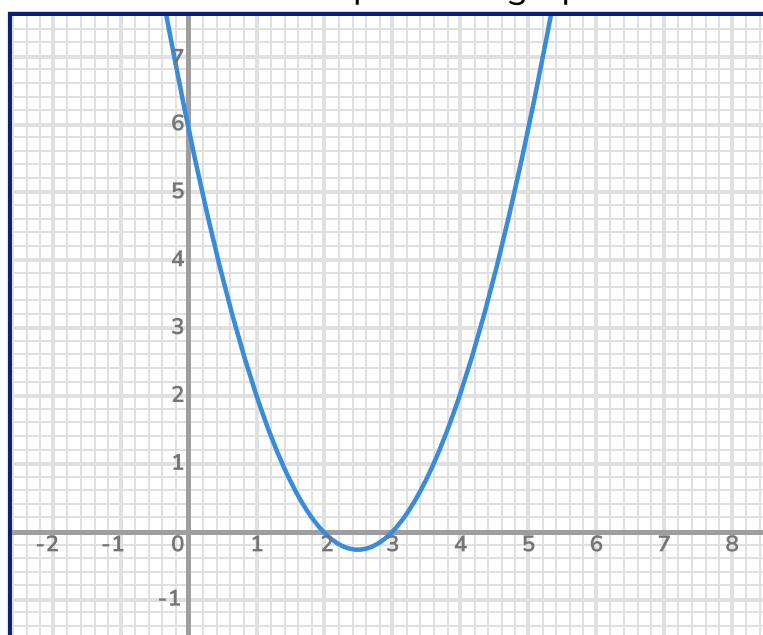
## Diagnostic Questions: Quadratic Graphs

10. Use this graph of  $y = 1 - 3x - 2x^2$  to find the approximate solutions to the equation  $2x^2 + 3x = 1$



A) $x \approx -1.8$ and $x \approx 0.3$	B) $x \approx -0.3$ and $x \approx 1.8$
C) $x \approx 0.3$ and $x \approx 1.8$	D) $x \approx -1.5$ and $x \approx 0$

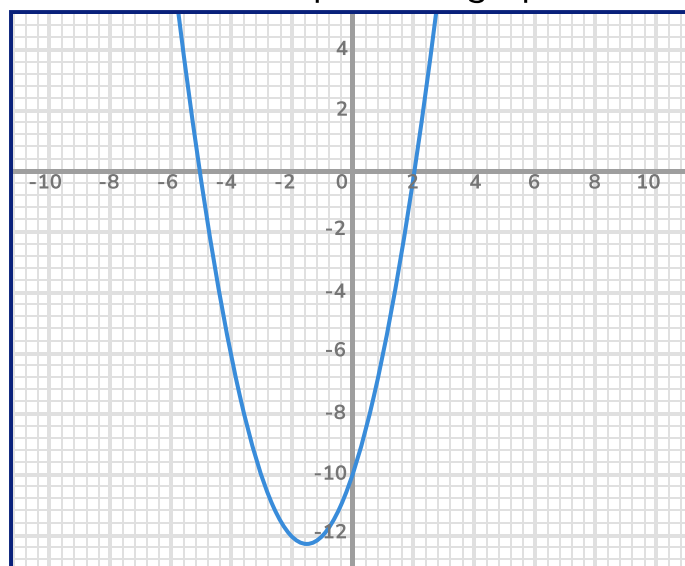
11. Select the equation that matches the quadratic graph:



A) $y = x^2 + 5x + 6$	B) $y = 6 - 5x - x^2$
C) $y = x^2 - 5x - 6$	D) $y = x^2 - 5x + 6$

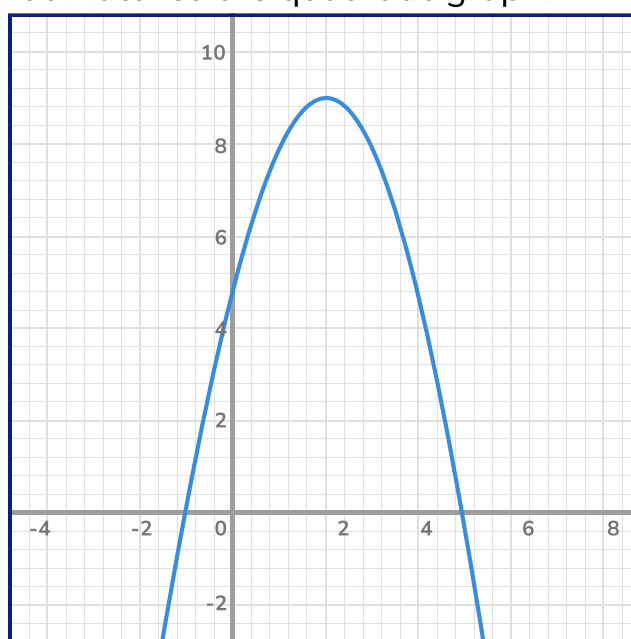
## Diagnostic Questions: Quadratic Graphs

12. Select the equation that matches the quadratic graph:



A) $y = x^2 + 7x + 10$	B) $y = x^2 + 3x - 10$
C) $y = 2x^2 + 3x - 5$	D) $y = -x^2 - 3x + 10$

13. Select the equation that matches the quadratic graph:

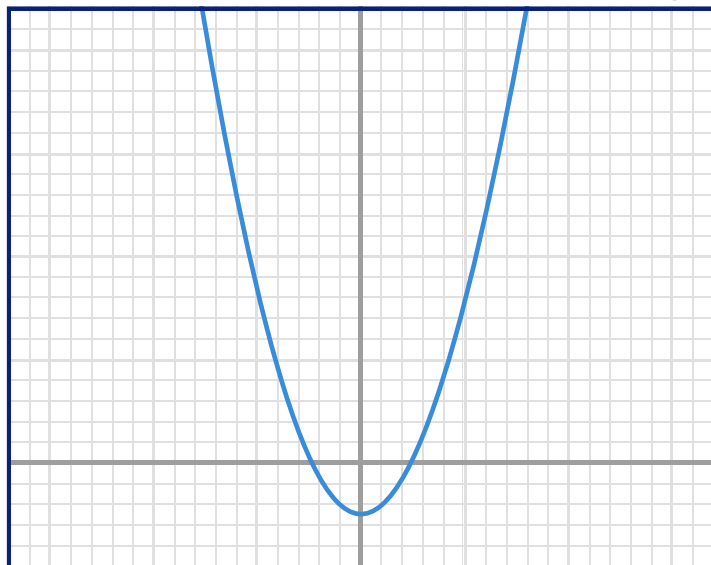


A) $y = x^2 - 4x - 5$	B) $y = -x^2 - 4x - 5$
C) $y = -x^2 + 4x + 5$	D) $y = 5 - x^2$



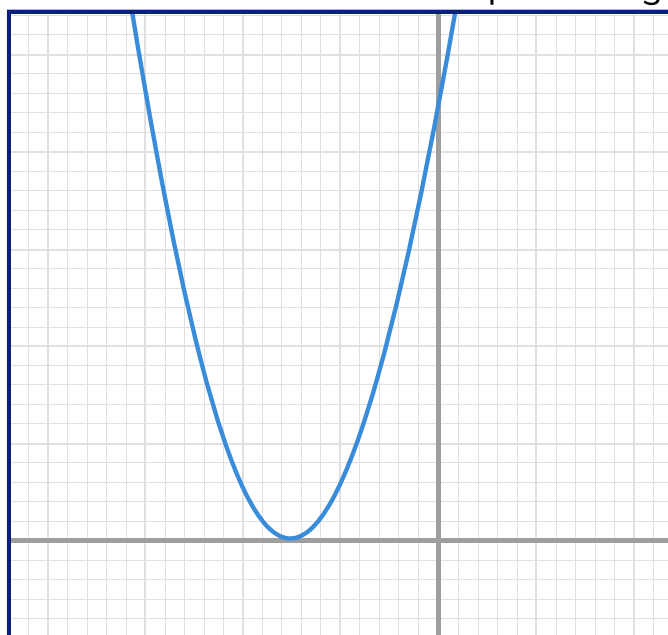
## Diagnostic Questions: Quadratic Graphs

14. Select the equation that matches the sketch of a quadratic graph:



A) $y = x^2 - 1$	B) $y = x^2 + 1$
C) $y = 1 - x^2$	D) $y = x^2 + x - 1$

15. Select the equation that matches the sketch of a quadratic graph:



A) $y = x^2 + 9x$	B) $y = 9 - 6x - x^2$
C) $y = x^2 + 6x + 9$	D) $y = x^2 - 6x + 9$

## Diagnostic Questions: Quadratic Graphs Answers

1. If  $x = 3$  find the value of  $y$  on the quadratic graph with equation:

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

A) 31 Student found sum of all terms

B) 1 Correct answer

C) -2 Student doubled  $x$  (rather than squaring) in the first term

D) -13 Student subtracted  $(5x + 7)$  from  $x^2$

2. If  $x = -4$  find the value of  $y$  on the quadratic graph with equation:

$$y = x^2 + 3x - 9$$

A) -37 Student did not square a negative number correctly

B) 19 Student found second term as  $3 \times 4$

C) 13 Student used variable correctly, but added the 9

D) -5 Correct answer

3. If  $x = -1$  find the value of  $y$  on the quadratic graph with equation:

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

A) 1 Student evaluated second term incorrectly

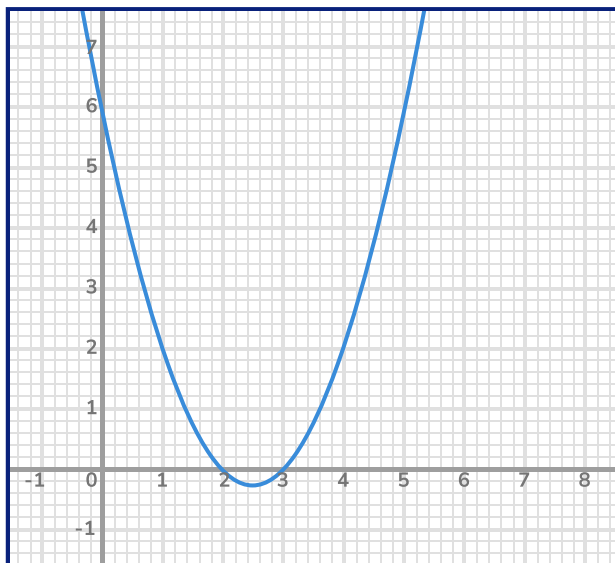
B) -1 Student did not square a negative number correctly

C) 5 Correct answer

D) -5 Student made several mistakes manipulating negative numbers

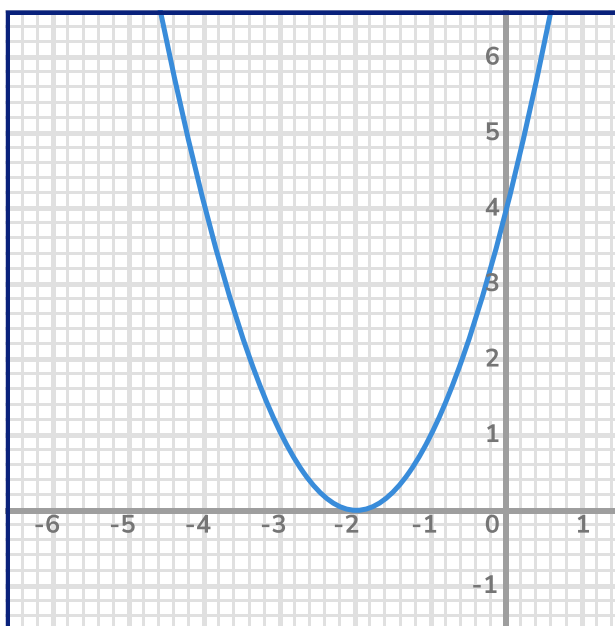
## Diagnostic Questions: Quadratic Graphs Answers

4. Using this graph of  $y = x^2 - 5x + 6$ , solve the equation  $x^2 - 5x + 6 = 0$



- A)  $x = 6$  Student wrote down the  $y$ -intercept
- B)  $x = 2$  Student only included one solution
- C)  $x = 2$  or  $x = 3$  Correct answer
- D)  $x = 3$  Student only included one solution

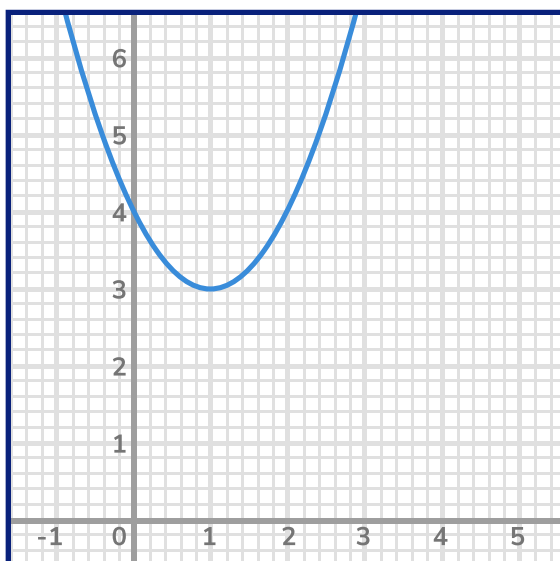
5. Using this graph of  $y = x^2 + 4x + 4$ , solve the equation  $x^2 + 4x + 4 = 0$



- A)  $x = -2$  Correct answer
- B)  $x = 2$  Student forgot to include the sign of the number
- C)  $x = 4$  Student wrote down the  $y$ -intercept
- D)  $x = 0$  Student does not understand how to solve a quadratic equation graphically

## Diagnostic Questions: Quadratic Graphs Answers

6. Using this graph of  $y = x^2 - 2x + 4$ , find the coordinates of the turning point:



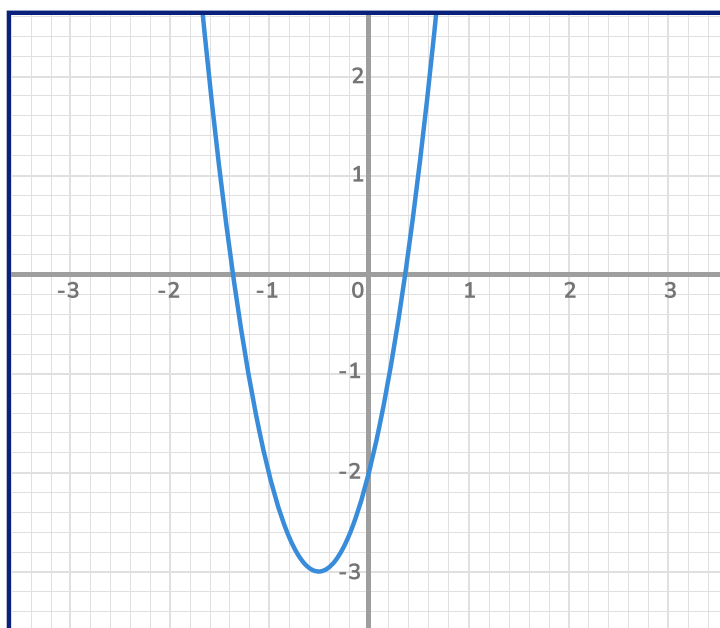
A) (1, 3) Correct answer

B) (3, 1) Student mixed up  $x$  and  $y$  coordinates

C) (0, 4) Student wrote down the  $y$ -intercept

D) (-2, 4) Student lacks the understanding of quadratic graphs

7. Using this graph of  $y = 4x^2 + 4x - 2$ , find the coordinates of the turning point:



A) (0, -2) Student wrote down the  $y$ -intercept

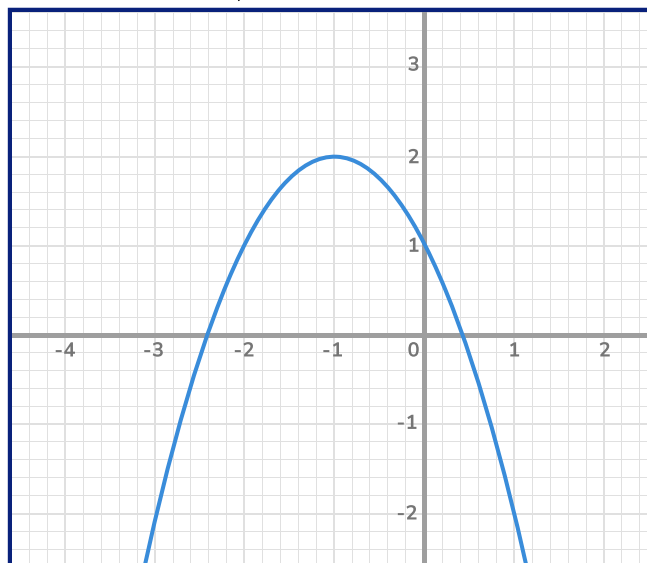
B) (-3, -0.5) Student mixed up  $x$  and  $y$  coordinates

C) (-1.3, 0.3) Student tried to approximate roots

D) (-0.5, -3) Correct answer

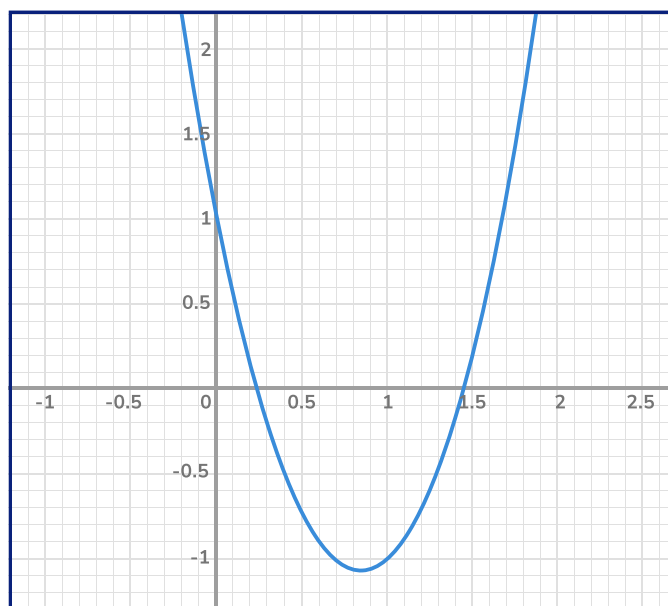
## Diagnostic Questions: Quadratic Graphs Answers

8. Using this graph of  $y = 1 - 2x - x^2$ , find the coordinates of the turning point:



- A) (1, 2) Student missed the sign from the  $x$ -coordinate
- B) (0, 1) Student wrote down the  $y$ -intercept
- C) (-1, 2) Correct answer
- D) (2, 1) Student lacks the understanding about turning points

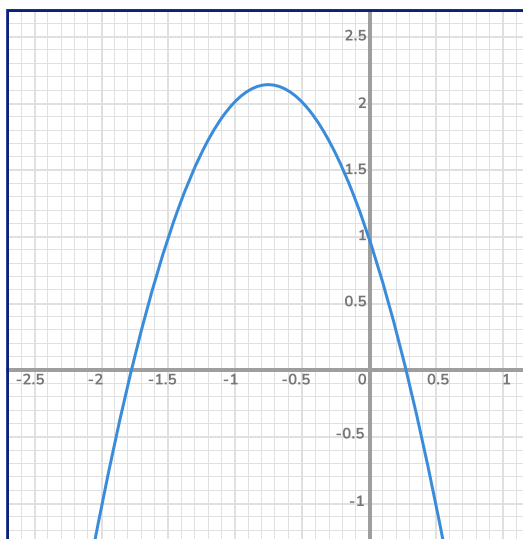
9. Use this graph of  $y = 3x^2 - 5x + 1$  to find the approximate solutions to the equation  $3x^2 + 1 = 5x$



- A)  $x \approx 0$  and  $x \approx 1.7$  Student read values at  $y = 1$
- B)  $x \approx 1$  and  $x \approx 7$  Student multiplied approximate solutions by 5
- C)  $x \approx -0.2$  and  $x \approx -1.4$  Student introduced negation to the solutions
- D)  $x \approx 0.2$  and  $x \approx 1.4$  Correct answer

## Diagnostic Questions: Quadratic Graphs Answers

10. Use this graph of  $y = 1 - 3x - 2x^2$  to find the approximate solutions to the equation  $2x^2 + 3x = 1$



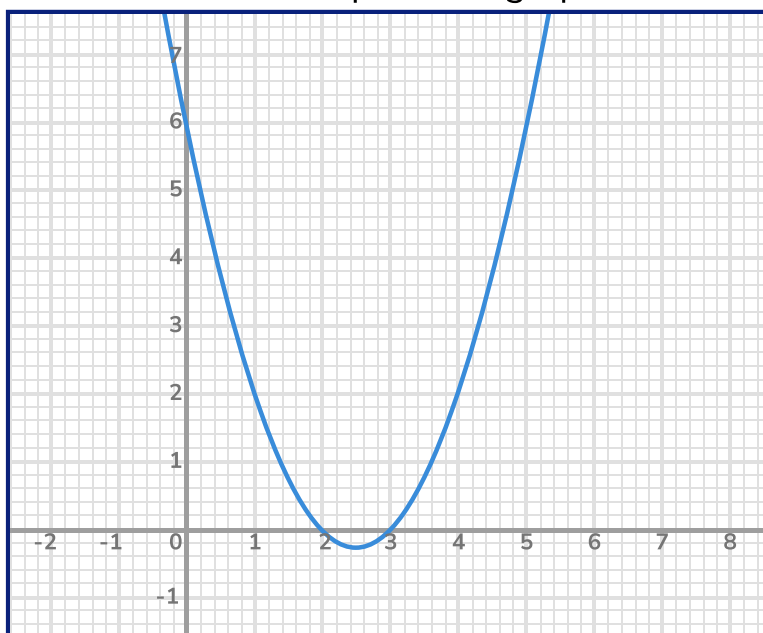
A)  $x \approx -1.8$  and  $x \approx 0.3$  Correct answer

B)  $x \approx -0.3$  and  $x \approx 1.8$  Student made mistakes with minus signs

C)  $x \approx 0.3$  and  $x \approx 1.8$  Student gave both solutions as being positive

D)  $x \approx -1.5$  and  $x \approx 0$  Student read off values at  $y = 1$

11. Select the equation that matches the quadratic graph:



A)  $y = x^2 + 5x + 6$  Student did not use the roots correctly

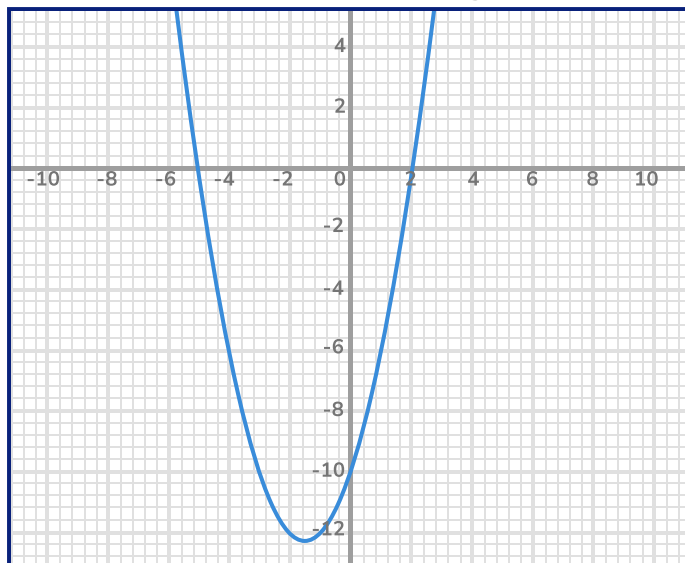
B)  $y = 6 - 5x - x^2$  Student mistook the sign on  $x^2$

C)  $y = x^2 - 5x - 6$  Student did not check  $y$ -intercept

D)  $y = x^2 - 5x + 6$  Correct answer

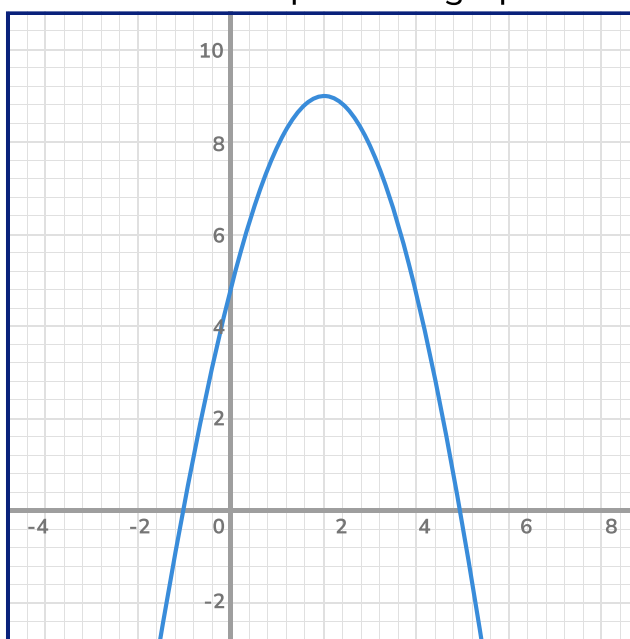
## Diagnostic Questions: Quadratic Graphs Answers

12. Select the equation that matches the quadratic graph:



- A)  $y = x^2 + 7x + 10$  Student used roots incorrectly  
 B)  $y = x^2 + 3x - 10$  **Correct answer**  
 C)  $y = 2x^2 + 3x - 5$  Student made several errors  
 D)  $y = -x^2 - 3x + 10$  Student found the reflection of the quadratic graph (in the  $x$ -axis)

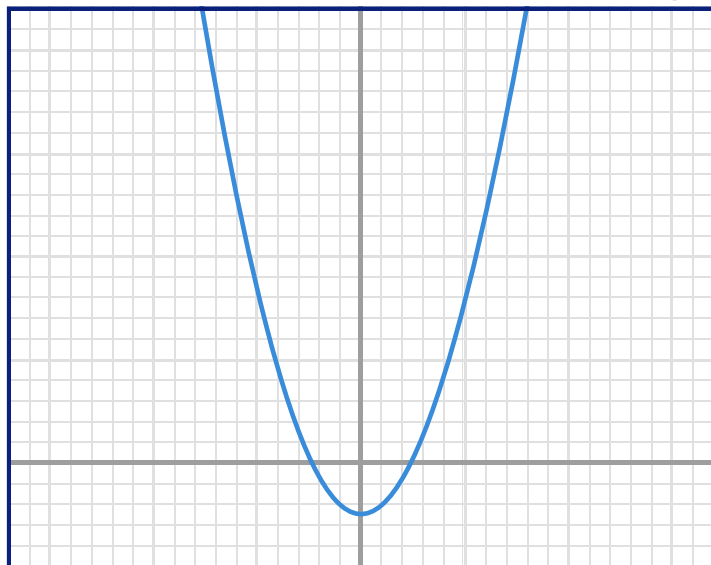
13. Select the equation that matches the quadratic graph:



- A)  $y = x^2 - 4x - 5$  Student did not consider the shape of the graph  
 B)  $y = -x^2 - 4x - 5$  Student made mistakes using the roots  
 C)  $y = -x^2 + 4x + 5$  **Correct answer**  
 D)  $y = 5 - x^2$  Student used intercept and shape, but did not use roots

## Diagnostic Questions: Quadratic Graphs Answers

14. Select the equation that matches the sketch of a quadratic graph:



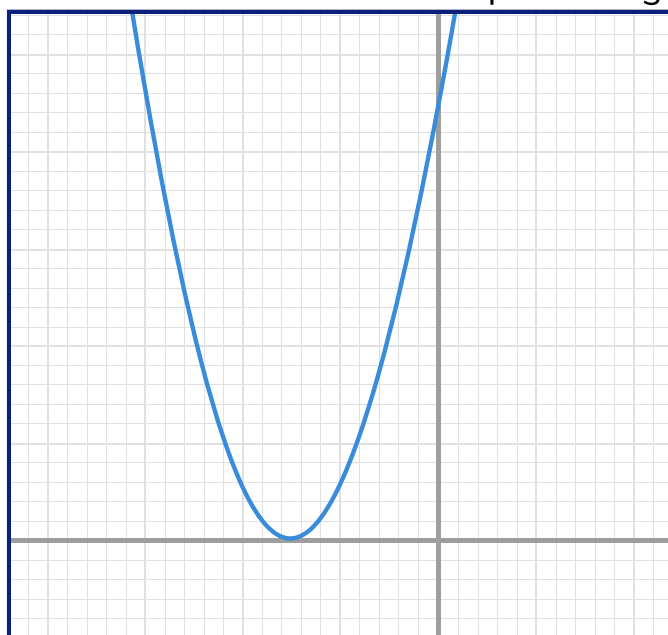
A)  $y = x^2 - 1$  Correct answer

B)  $y = x^2 + 1$  Student did not consider the  $y$ -intercept

C)  $y = 1 - x^2$  Student did not consider shape of graph

D)  $y = x^2 + x - 1$  Student did not consider symmetry about  $y$ -axis

15. Select the equation that matches the sketch of a quadratic graph:



A)  $y = x^2 + 9x$  Student did not consider the roots of the graph

B)  $y = 9 - 6x - x^2$  Student did not consider shape of graph

C)  $y = x^2 + 6x + 9$  Correct answer

D)  $y = x^2 - 6x + 9$  Student did not consider location of roots



# Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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