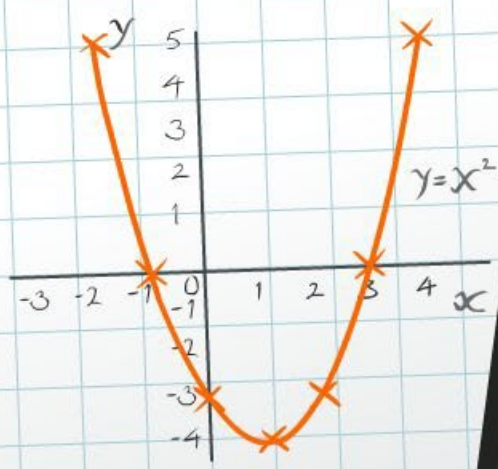
Using graphs to solve equations

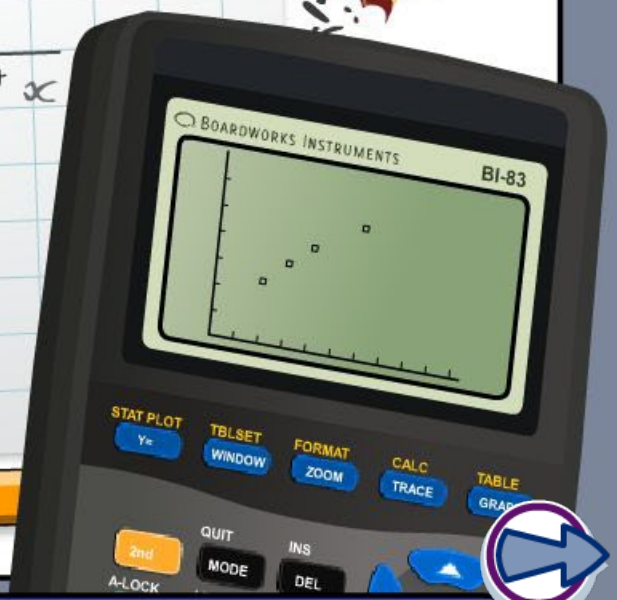
x	-2	-1	0	1	2	3	4
y	5	0	-3	-4	-3	0	5

$x^2 - 2x - 3 = 0$

$(x+1)(x-3) = 0$

$x = -1$ or $x = 3$





Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

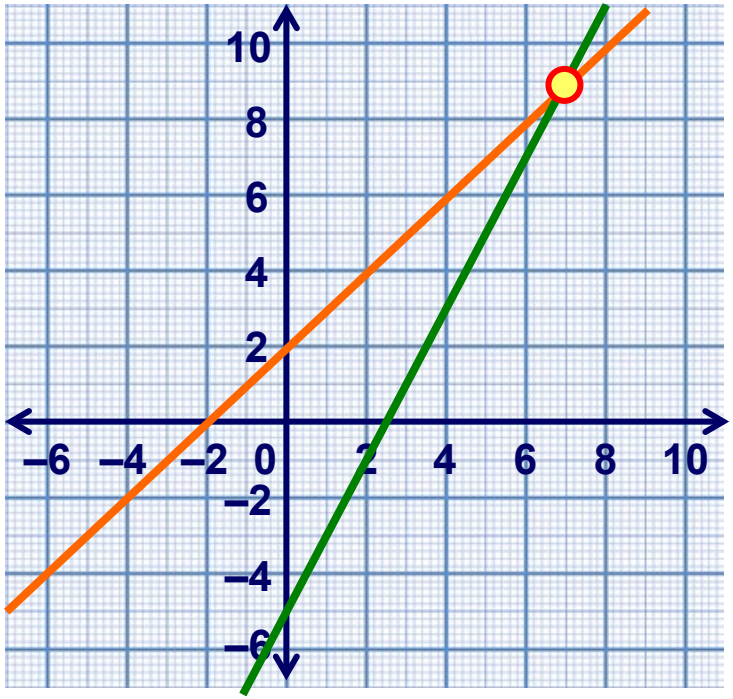
What does it mean to solve an equation?

Look at the equation $x + 2 = 2x - 5$.

Solving the equation means finding any values of x that make it true.

Think about the line $y = x + 2$.

There is a point on this line where x satisfies the equation. At that point, the y-value must also equal $2x - 5$.



This means the point is also on the line $y = 2x - 5$.

This point is where the lines $y = x + 2$ and $y = 2x - 5$ **intersect**.

Separate functions

Solve the equation $2x^2 - 5 = 3x$ using graphs.

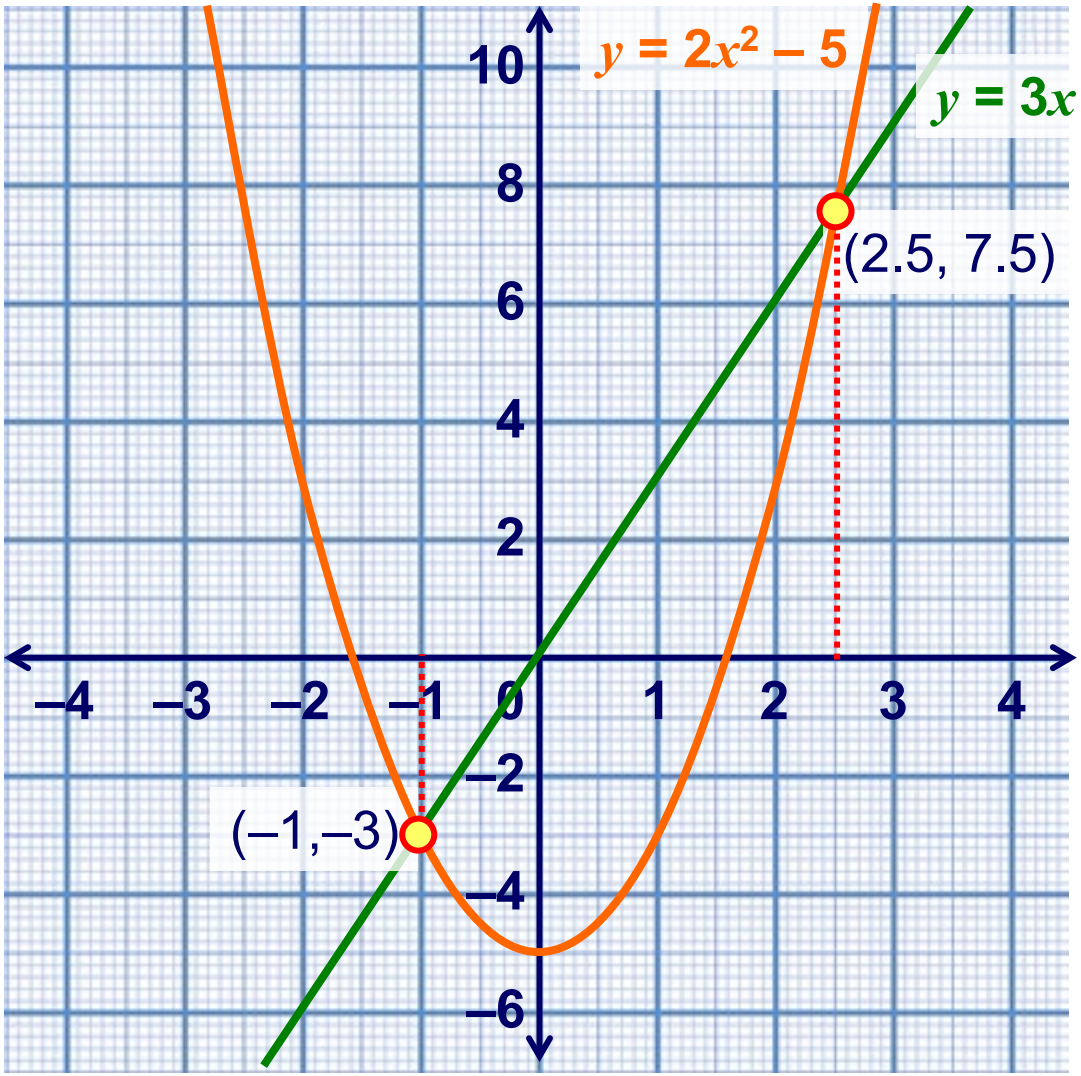
Treat the left side and the right side of the equation as two separate functions.

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

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

The points where the two graphs intersect give the solutions to the equation.

Points of intersection



The graphs of $y = 2x^2 - 5$ and $y = 3x$ intersect at the points:

$(-1, -3)$

and $(2.5, 7.5)$.

The x-values at these coordinates are the solutions to the equation $2x^2 - 5 = 3x$:

$x = -1$

and $x = 2.5$

Practice solving equations

Use this activity to practice solving equations using graphs.
Choose an equation and find the point of intersection to solve the equation.

Press "**start**" to begin.

start

A single function

We could also have solved the equation by rearranging so that all the terms are on the right-hand side.

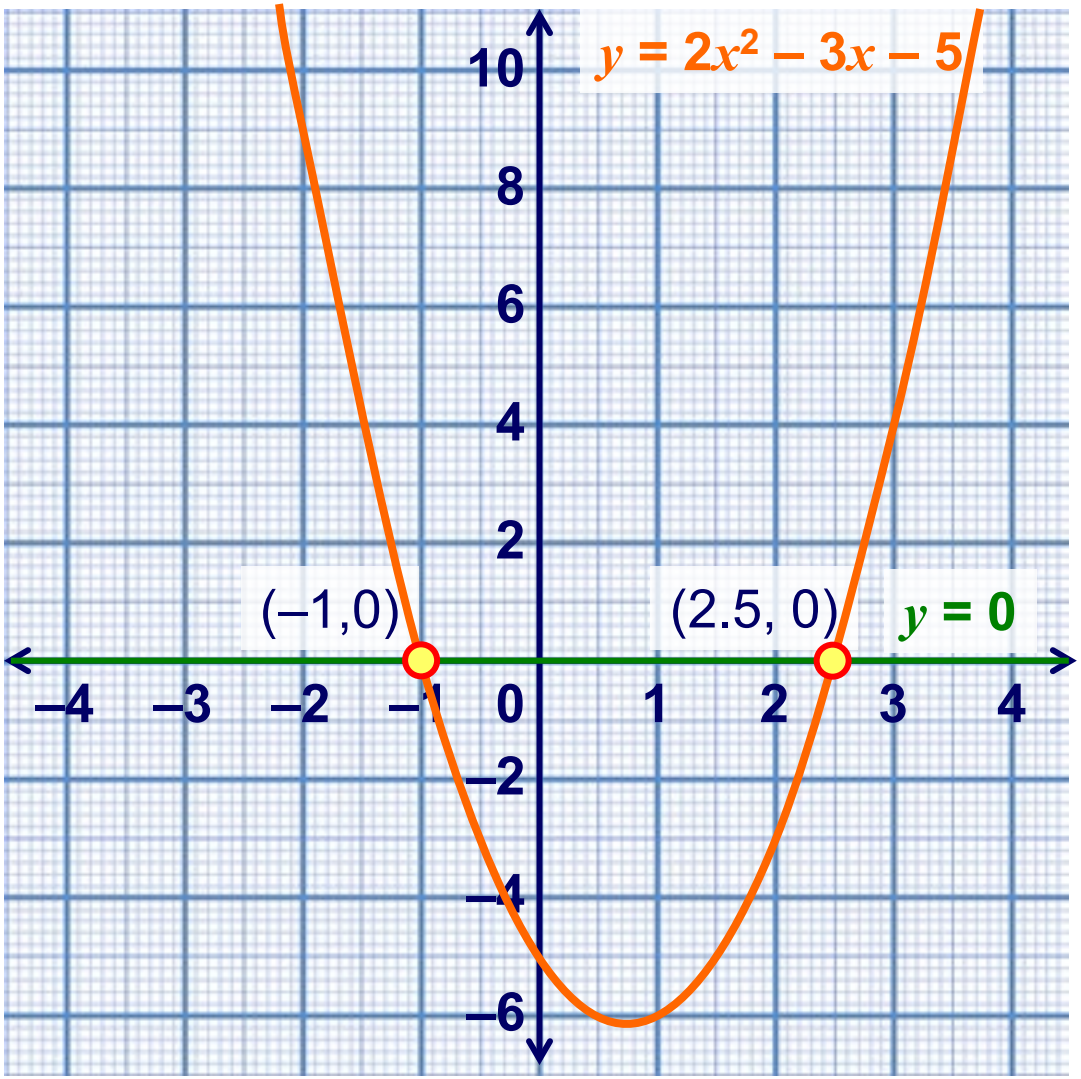
Solve the equation $2x^2 - 5 = 3x$ using graphs.

$$2x^2 - 3x - 5 = 0$$

$$y = 2x^2 - 3x - 5 \qquad y = 0$$

The line $y = 0$ is the x-axis. This means that the solutions to the equation $2x^2 - 3x - 5 = 0$ are the **roots** of the graph $y = 2x^2 - 3x - 5$.

x-intersect



The graphs of $y = 2x^2 - 3x - 5$ and $y = 0$ intersect at the points:

$(-1, 0)$

and $(2.5, 0)$.

The x-values of these coordinates are the solutions:

$x = -1$

and $x = 2.5$

Graphing calculators

We can solve equations using graphing calculators.

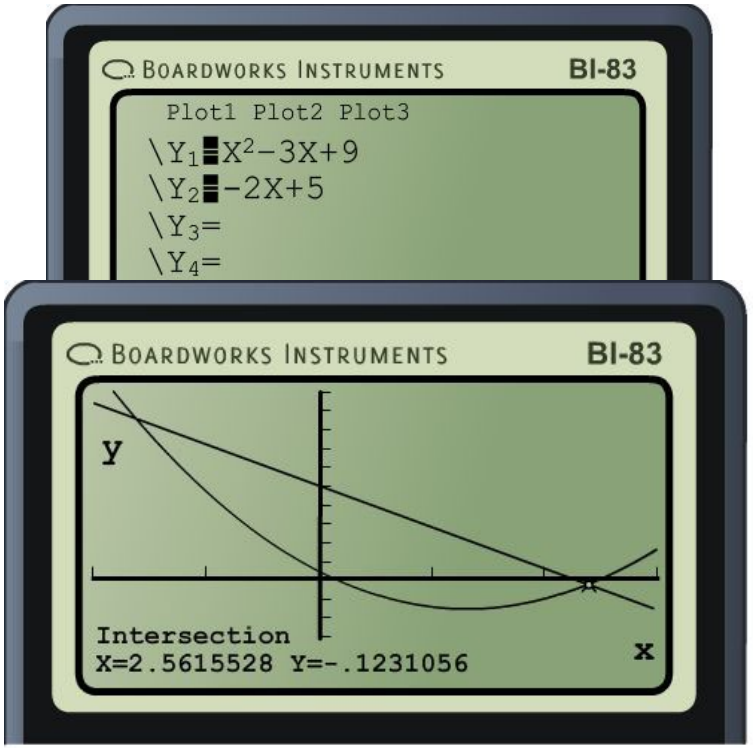
Solve the equation $x^2 - 3x + 1 = -2x + 5$ using a graphing calculator.

Press "Y=" and type in "Y1=X²–3X+1" and "Y2=-2X+5".

Press "GRAPH" to draw the graphs.

Use "CALC", the secondary function on the "TRACE" key, to find the points of intersection.

Remember that we only need the x-coordinates.



$x = 2.56$ and $x = -1.56$ (to the nearest hundredth)