

Non-linear inequalities

A LEVEL LINKS

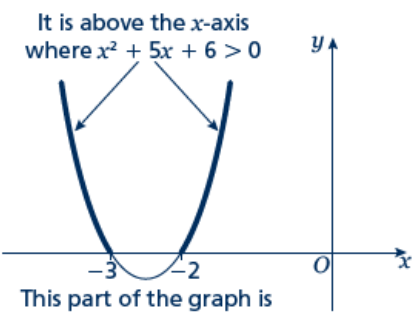
Scheme of work: 1d. Inequalities – linear and quadratic (including graphical solutions)

Key points

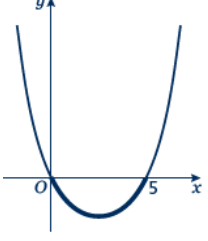
- First replace the inequality sign by = and solve the quadratic equation.
- Sketch the graph of the quadratic function.
- Use the graph to find the values which satisfy the quadratic inequality.

Examples

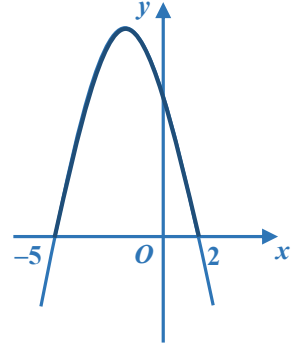
Example 1 Find the set of values of x which satisfy $x^2 + 5x + 6 > 0$

<p>$x^2 + 5x + 6 = 0$ $(x + 3)(x + 2) = 0$ $x = -3$ or $x = -2$</p>  <p>$x < -3$ or $x > -2$</p>	<ol style="list-style-type: none">1 Solve the quadratic equation by factorising.2 Sketch the graph of $y = (x + 3)(x + 2)$3 Identify on the graph where $x^2 + 5x + 6 > 0$, i.e. where $y > 0$4 Write down the values which satisfy the inequality $x^2 + 5x + 6 > 0$
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Example 2 Find the set of values of x which satisfy $x^2 - 5x \leq 0$

$x^2 - 5x = 0$ $x(x - 5) = 0$ $x = 0 \text{ or } x = 5$  $0 \leq x \leq 5$	<ol style="list-style-type: none"> 1 Solve the quadratic equation by factorising. 2 Sketch the graph of $y = x(x - 5)$ 3 Identify on the graph where $x^2 - 5x \leq 0$, i.e. where $y \leq 0$ 4 Write down the values which satisfy the inequality $x^2 - 5x \leq 0$
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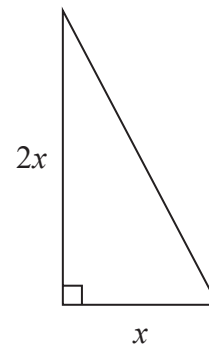
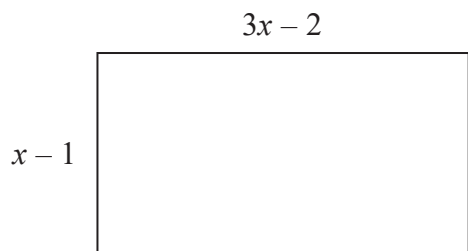
Example 3 Find the set of values of x which satisfy $-x^2 - 3x + 10 \geq 0$

$-x^2 - 3x + 10 = 0$ $(-x + 2)(x + 5) = 0$ $x = 2 \text{ or } x = -5$  $-5 \leq x \leq 2$	<ol style="list-style-type: none"> 1 Solve the quadratic equation by factorising. 2 Sketch the graph of $y = (-x + 2)(x + 5) = 0$ 3 Identify on the graph where $-x^2 - 3x + 10 \geq 0$, i.e. where $y \geq 0$ 3 Write down the values which satisfy the inequality $-x^2 - 3x + 10 \geq 0$
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Practice questions

- 1 n is an integer such that $3n + 2 \leq 14$ and $\frac{6n}{n^2 + 5} > 1$
Find all the possible values of n .

- 2 Here is a rectangle and a right-angled triangle.



All measurements are in centimetres.

The area of the rectangle is greater than the area of the triangle.

Find the set of possible values of x .

- 3 Solve the inequality $\frac{m^2 + 3}{4} > 21$

- 4 Solve $22 < \frac{m^2 + 7}{4} < 32$

Answers

1 $n = 2, 3, 4$

2 $x > 2$

3 $m > 9, m < 9$

4 $9 < m < 11$
 $-11 < m < -9$