Year 10 higher topic 15

Equations and graphs

What careers would use these skills?

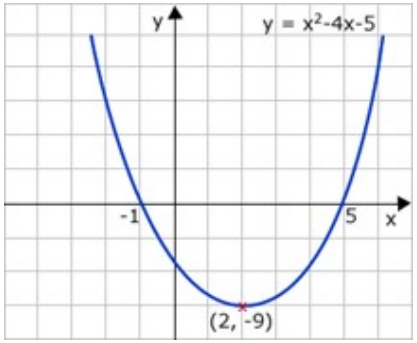
Financial analyst, engineer, architect, builder, resource manager, health care

Sketch quadratic graphs

A U-shaped curve called a parabola. The equation is in the form

$y = ax^2 + bx + c$ where a, b and c are numbers and $a \neq 0$.

Eg.



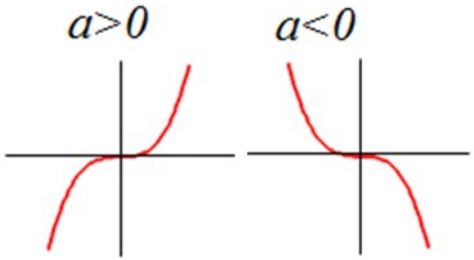
If a < 0, the parabola is upside down.

Sketch cubic graphs

The equation is in the form $y = ax^3 + k$, where k is a number.

If a>0, the curve is increasing.

If a<0, the curve is decreasing.



Graphical inequalities

For > and < use a dotted line.

For ≤ and ≥ use a solid line.

For < and ≤ shade below a diagonal line or left of a vertical line.

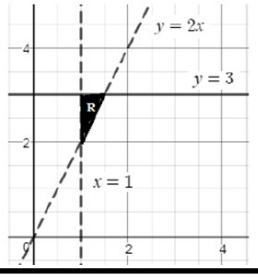
For > and ≥ shade above a diagonal line or right of a vertical line

Eg. Shade the region that satisfies:

y > 2x

x > 1

y ≤ 3



Quadratic inequalities

1. Sketch the quadratic graph of the inequality.
2. If the expression is > or ≥ then the answer will be above the x-axis.
3. If the expression is < or ≤ then the answer will be below the x-axis.
4. Look carefully at the inequality symbol in the question.
5. Look carefully if the quadratic is a positive or a negative parabola.

Eg. Solve the inequality

$x^2 - x - 12 < 0$

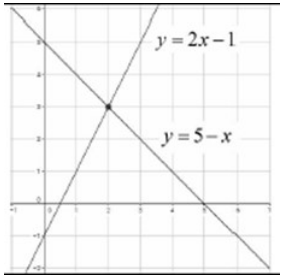
The required region is below the x axis so the answer is $-3 < x < 4$.

If the questions had been > 0, the answer would have been $x < -3$ and $x > 4$.

Graphical simultaneous equations

Draw the graphs of the two equations.

The solutions will be where the lines meet.



Solution (2,3)

Iterative formula

To create an iterative formula, rearrange an equation with more than one x term to make one of the x terms the subject.

You will be given the first value to substitute in, often called .

Keep substituting in your previous answer until your answers are the same to a certain degree of accuracy. This is called converging to a limit.

Use the 'ANS' button on your calculator to keep substituting in the previous answer.

Quadratic iterations

The act of repeating a process over and over again, often with the aim of approximating a desired result more closely.

Recursive Notation:

$$x_{n+1} = \sqrt{3x_n + 6}$$

Eg.

$$x_1 = 4$$
$$x_2 = \sqrt{3 \times 4 + 6} = 4.242640\ldots$$
$$x_3 = \sqrt{3 \times 4.242640\ldots + 6} = 4.357576\ldots$$