

Graphs – Summary

A – Straight lines

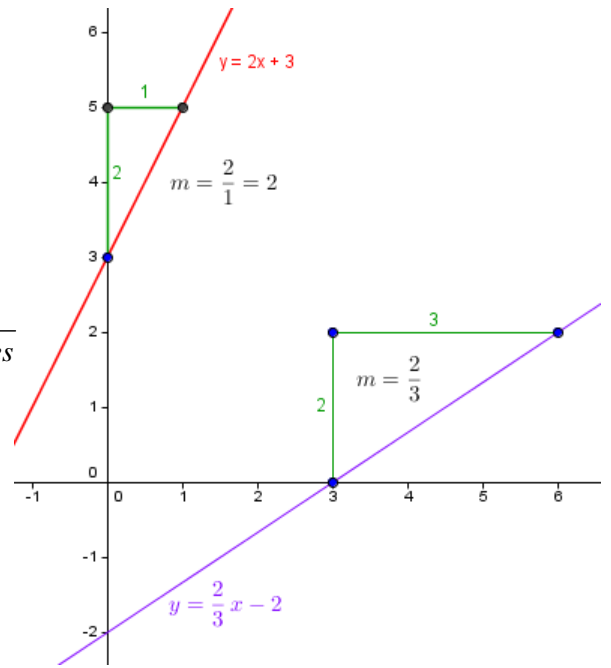
1 – Explicit equations

- $x = k$ "Vertical lines going through $x = k$ "
- $y = k$ "Horizontal lines going through $y = k$ "
- $y = mx + c$

m is called the GRADIENT of the line (Steepness)

For any two points on the line, $m = \frac{\text{Difference of } y\text{-coordinates}}{\text{Difference of the } x\text{-coordinates}}$

c is called the y-intercept. (where the line crosses the y-axis)



2 – Implicit equations

An equation of a line can be expressed as

$$ax + by = c$$

- To work out the gradient and the intercept, re-arrange the equation, making y the subject:

$$y = -\frac{a}{b}x + \frac{c}{b}$$

- To plot the line $ax + by = c$, use the **cover up method**:

work out "y" when $x = 0$ (0, ...)

then work out "x" when $y = 0$ (... , 0)

3 – Parallel and perpendicular lines

- Two lines are parallel when they have the same gradient

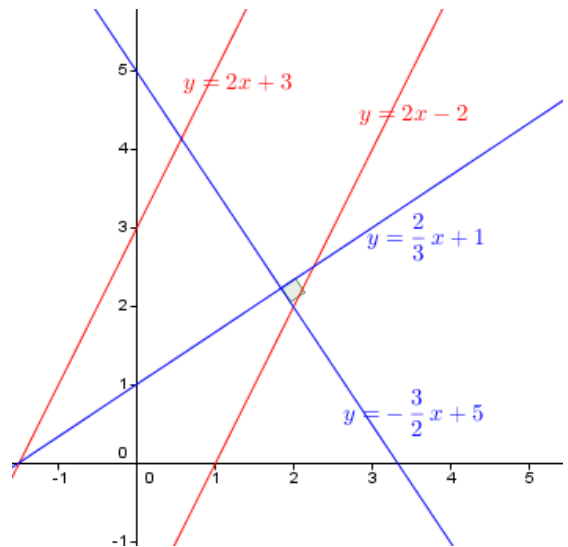
$$y = m_1x + c_1 \text{ and } y = m_2x + c_2 \text{ when } m_1 = m_2$$

- Two lines are perpendicular when their gradients are

negative reciprocal: m and $-\frac{1}{m}$

examples: $y = 2x + 3$ and $y = -\frac{1}{2}x + 7$ are perpendicular

$y = \frac{2}{3}x + 4$ and $y = -\frac{3}{2}x - 9$ are perpendicular



B – Quadratic graphs

1 – Plotting graphs

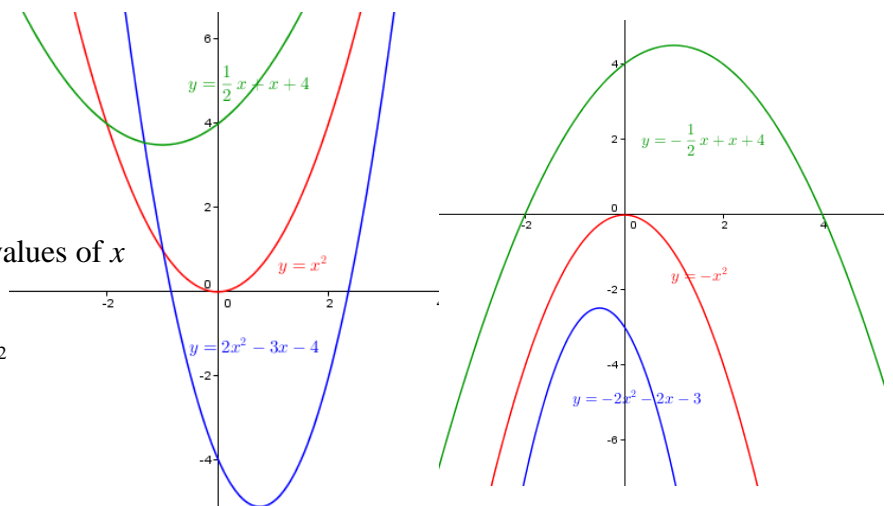
The equation of a quadratic graph can

be written as : $y = ax^2 + bx + c$

Be careful: When substituting negative values of x

use brackets: $y = a \times (\dots)^2 + b \times (\dots) + c$

- The "simplest" quadratic graph is $y = x^2$



2 – Graphs and equations

• Solving equations using graphs is to read the x-coordinates of the points of intersection

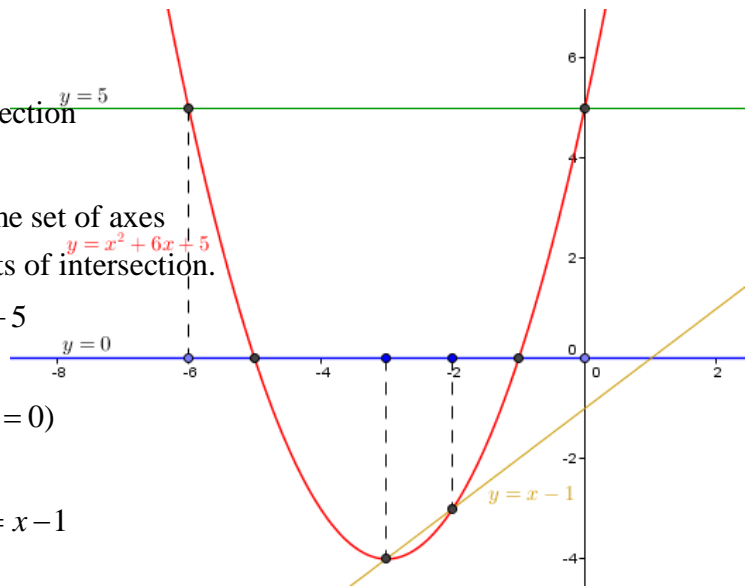
• To solve $ax^2 + bx + c = mx + c$

plot $y = ax^2 + bx + c$ and $y = mx + c$ on the same set of axes

The solutions are the x-coordinates of the points of intersection.

Examples: We have plotted the graph $y = x^2 + 6x + 5$

- to solve $x^2 + 6x + 5 = 0$,
read where the graph crosses the x-axis ($y = 0$)
- to solve $x^2 + 6x + 5 = 5$, plot the line $y = 5$.
- to solve $x^2 + 6x + 5 = x - 1$, plot the line $y = x - 1$

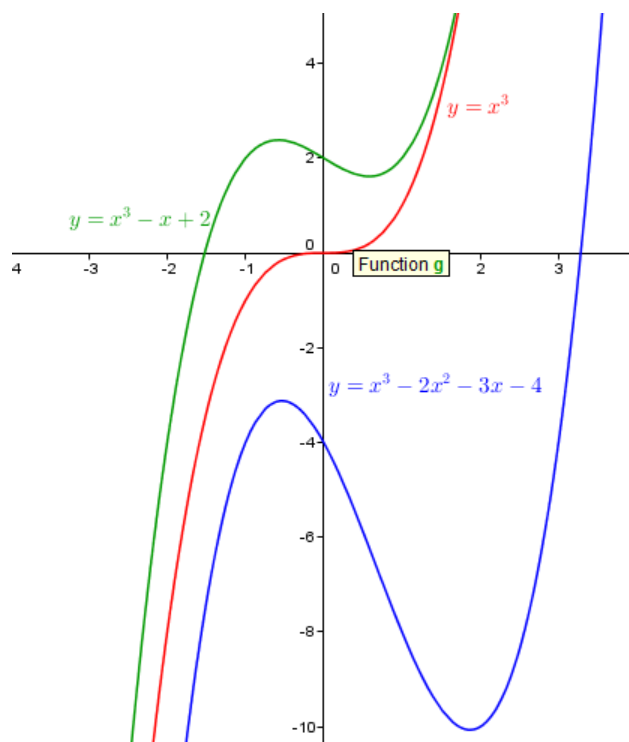


C – Other graphs

1 – Cubic graphs

- $y = x^3$
- $y = ax^3 + bx^2 + cx + d$

You need to be able to recognise the shape of a cubic graph



2 – Reciprocal graphs

- $y = \frac{1}{x}$
- $y = \frac{k}{x}$ (k is a value)

You need to be able to recognise the shape of a reciprocal graph

