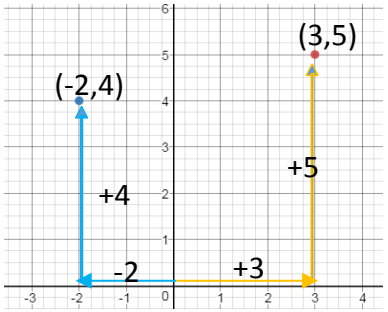
The Basics

Plotting Coordinates

x → **(3, 5)** ← y

Each coordinate has an x-value and a y-value. This allows us to plot them on a graph.
The x-coordinate is plotted on the horizontal (x) axis and the y-coordinate is plotted on the vertical (y) axis.

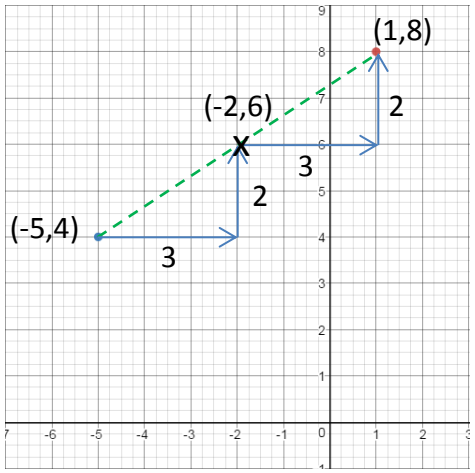


Gradient – the amount you go up or down when you go right 1 unit
Y-intercept – where the line crosses (intercepts) the y-axis.

Midpoints

The midpoint is the coordinate exactly in the middle of two points. We can either find this by using a graph or algebraically.

Graphically:



Algebraically:
Find the midpoint of (7, -2) and (3, 8).

$$x\ coordiate = \frac{7+3}{2} = \frac{10}{2} = 5$$

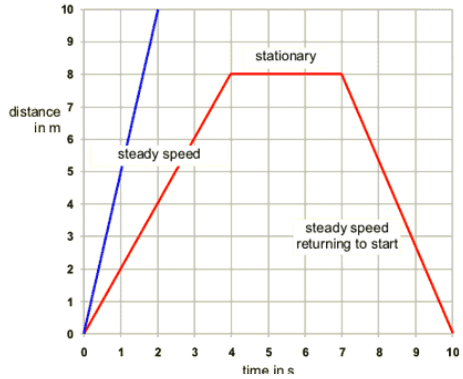
$$y\ coordiate = \frac{-2+8}{2} = \frac{6}{2} = 3$$

Midpoint = (5 , 3)

Real-life Graphs

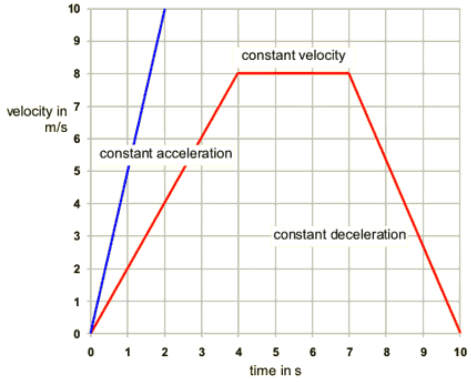
Distance-time graphs

Distance time graphs show distance away from a point. When an object is stationary, the line on the graph is horizontal. When an object is moving at a steady speed, the line on the graph is straight, but sloped. The steeper the line, the greater the speed of the object.



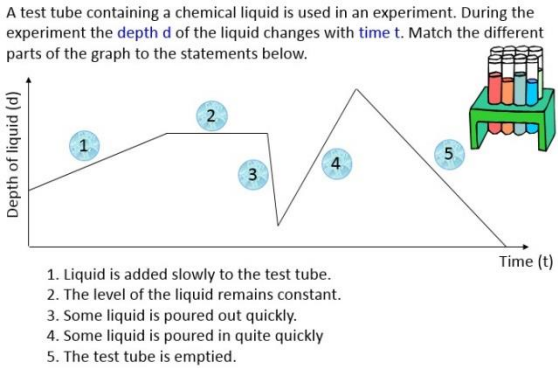
Speed-time graphs

A speed-time graph tells us how the speed of an object changes over time. When the object is travelling at a constant speed, the line on the graph is horizontal. When an object is accelerating or decelerating, the line on the graph is sloped. The steeper the gradient of the line, the greater the acceleration (a bigger change in speed in the same time).



Other real life graphs

Graphs can be used to represent a number of real life situations. It is important to read the labels on both axes to determine the meaning of the graph.
Example:

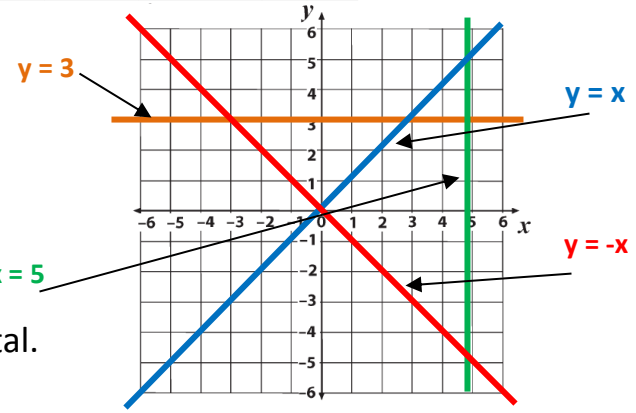


Key Words
Axes; Gradient; Coordinate; Axis; Vertical; Horizontal, plot, midpoint

Linked Topics
Coordinates; Straight line graphs; Gradients; Formulae; Kinematics; Compound measures; Plotting quadratic graphs; Equation of a line.

Plotting straight line graphs

For any equation of the form x = a, where a can take any value, the line will be vertical.
For any equation of the form y = b, where b can take any value, the line will be horizontal.
y = x is a diagonal line.

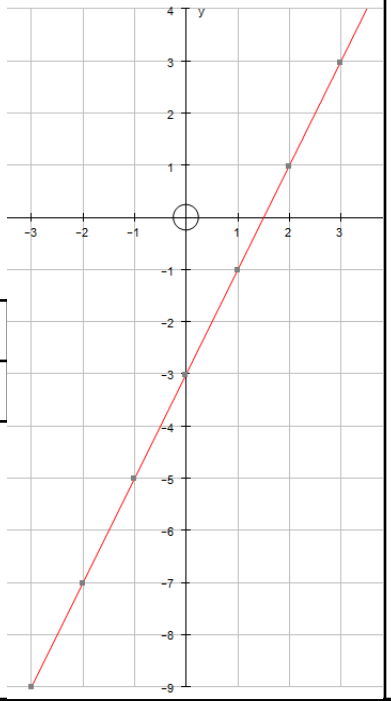


Example:
Plot the graph of y = 2x – 3 for -3 ≤ x ≤ 3.

- First draw a table of values and substitute each x-value into the formula to find the corresponding y-value.

X	-3	-2	-1	0	1	2	3
y	-9	-7	-5	-3	-1	1	3

- Plot each pair of coordinates: (-3, -9), (-2, -7), etc. – and draw a straight line through all of the points that reaches across the coordinate grid.

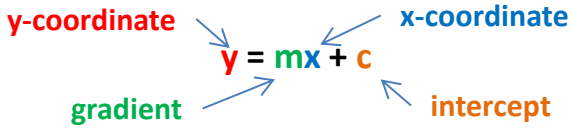


Parallel Lines

Two lines are parallel if they have the same gradient.
Example:
Give the equation of a line which is parallel to y = 5x + 1.
The answer to this is any line with equation y = 5x + a, where a is any number apart from +1, for example y = 5x + 4, y = 5x – 2, y= 5x + 100

Perpendicular Lines

Two lines are perpendicular if their gradients have a product of -1.
Example:
Give the equation of a line that is perpendicular to y = ½x + 3.
The answer to this would be any line with a gradient of -2 as -2 x ½ = -1, for example y = -2x – 2, y = -2x + 22



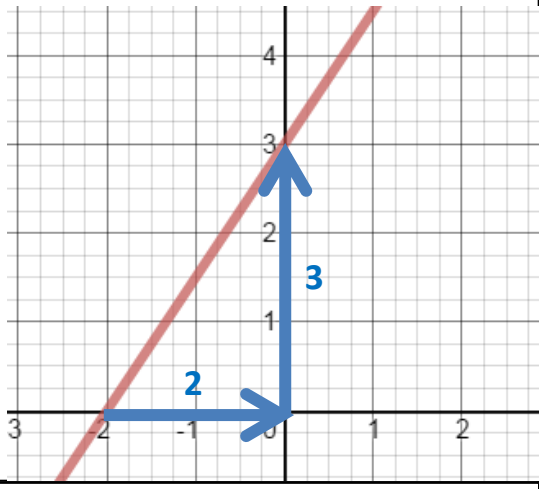
Gradient

Gradient or m is a measure of the steepness of a line. The higher the value of m, the steeper the line.

$$m = \frac{change\ in\ y}{change\ in\ x} = \frac{3}{2}$$

Intercept

The intercept or c is the y-value where the line crosses the y-axis.

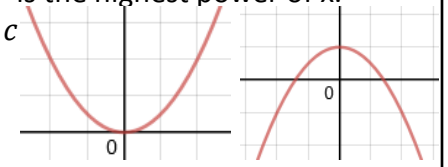


Key Words
Vertical, horizontal, diagonal, substitution

Linked Topics
Coordinates, plotting, substitution; Equation of a line, gradient, parallel and perpendicular, solving equations, quadratic and cubic graphs

Quadratic Graphs

An algebraic equation or expression where x^2 is the highest power of x.
Can look like $(x + a)(x + b)$ or $ax^2 + bx + c$

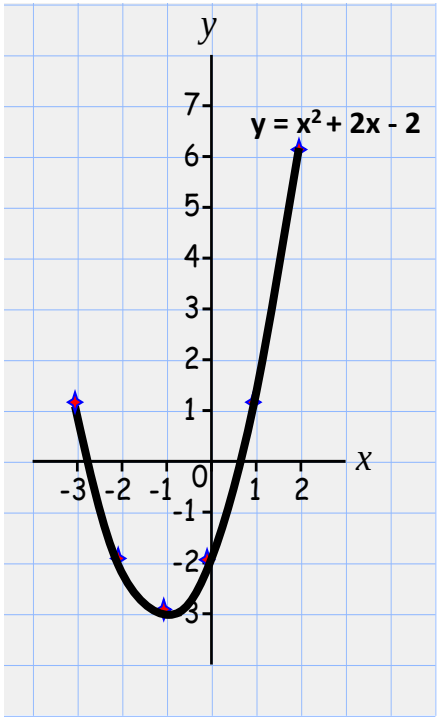


Positive quadratic u shaped graph →
Negative quadratic n shaped graph →

Other examples of quadratic graphs could be $y = x^2 + 2$, $y = 3x^2$, or $y = x^2 + 3x - 4$.

Example:
Plot the graph of $y = x^2 + 2x - 2$

x	-3	-2	-1	0	1	2
x^2	9	4	1	0	1	4
2x	-6	-4	-2	0	2	4
-2	-2	-2	-2	-2	-2	-2
y	1	-2	-3	-2	1	6



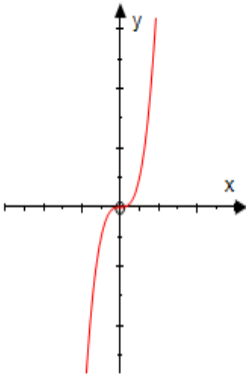
1) Draw a table of values to help, choosing appropriate values for x.
2) Remember that -2 in the equation is the intercept so it will run through
3) Find the values of x^2
4) Multiply each value of x by 2 to find the values of 2x
5) To find the values of y, we must sum all the values of x^2, 2x and -2.
6) Be careful with the negative signs.

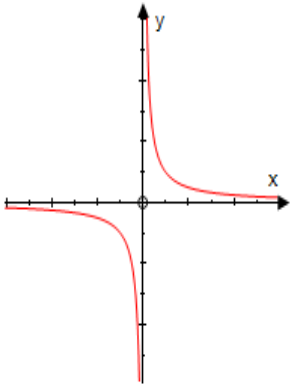
Sketching Graphs

To sketch any of these graphs, find all of the points where the graph will cross the x and y axes and any asymptotes. Ensure that the graph is the correct shape and label all of these points.

Cubic Graph

- The highest power of x is 3.
- The graph above shows $y = x^3$.
- Other examples of cubic graphs could be $y = x^3 - 5$, $y = 2x^3$, or $y = x^3 + x^2 + x + 1$.



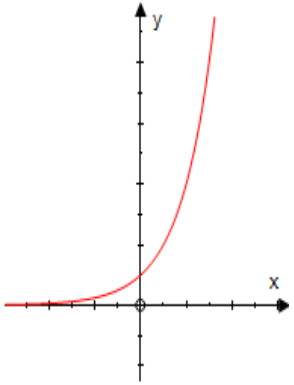


Reciprocal Graph

- The graph above shows $\frac{1}{x}$.
- In this example, there are asymptotes at the x and y axes – this means that the graph gets closer and closer to the axes without ever touching them.

Exponential Graph

- Shows a number to the power of x, for example $y = 2^x$ or $y = 3^x$.
- Will always go through the point (0,1).
- Asymptote at the x-axis.



Key Words
Quadratic; Cubic; Reciprocal; Exponential; Power; Asymptote.

Linked Topics
Equations; Indices; Solving equations; Graph transformations.