

Bridging Between Algebra and Calculus

Sketching Straight Lines

In this study guide you will learn how to sketch different types of straight lines: horizontal, vertical and diagonal. It shows two separate methods for sketching a line and discusses the difference between plotting and sketching.

Introduction

Often in mathematics, when a quick impression of a line is required rather than an accurate plot or computer representation, you are asked to **sketch** the graph of a given equation. Commonly the equation is that of a straight line or lines. For example you may be asked to visualise where simultaneous equations cross or to picture the region of a definite integration (see study guides : [Simultaneous Equations](#) and [Definite Integrals](#)). To get the most out of this guide you should be familiar with the basic mathematics of straight lines. You can read the study guides: [What is a Straight Line?](#) and [Finding Equations of Straight Lines](#) for help with this.

It is important that you know the difference between sketching and plotting graphs. A sketch depicts the important parts of a graph, it does not have to be to scale although it still has to be labelled correctly and any lines or points need to be correctly positioned in relation to each other and the axes. In a plot on the other hand, you work out precise positions of the coordinates of the graph and plot them either using a computer program or on graph paper. More details about sketching and plotting graphs can be found in the study guides: [Sketching a Graph](#) and [Plotting a Graph by Hand](#).

Sketching graphs of straight lines

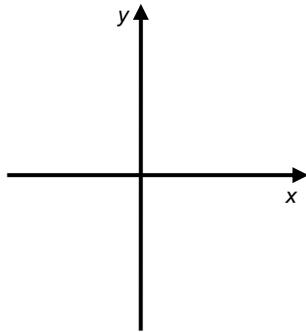
As with all sketches you must begin by drawing and labelling the x- and y-axes, this gives you an area in which to construct your sketch. It is important that you include both positive and negative values to accommodate all potential values of x and y. So you can always start your sketch with a large plus sign to represent the axes. You can then add information that you know or have worked out about the line until you can complete your sketch by drawing the line with a ruler.

It is common for you to be asked to sketch horizontal and vertical lines.

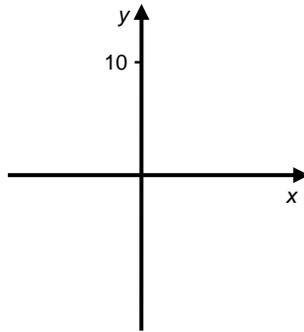
i. **Horizontal Lines:** Equations of the type $y = a$ where a is a number.

Straight lines of the type $y = a$ are **horizontal lines** which intercept the y -axis at the number a . You only need to know the value of a to complete your sketch.

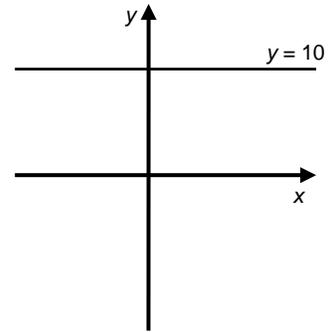
Example: Sketch the line $y = 10$.



Start with your axes



Add the y -intercept of 10

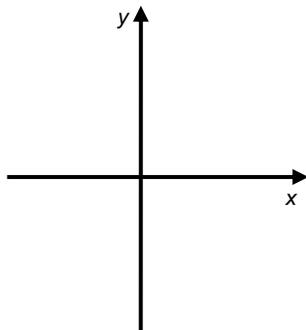


Draw and label the horizontal line to complete the sketch

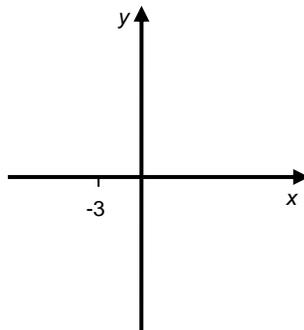
ii. **Vertical Lines:** Equations of the type $x = a$ where a is a number.

Straight lines of the $x = a$ type are **vertical lines** which intercept the x -axis at the number a . You only need to know the value of a to complete your sketch.

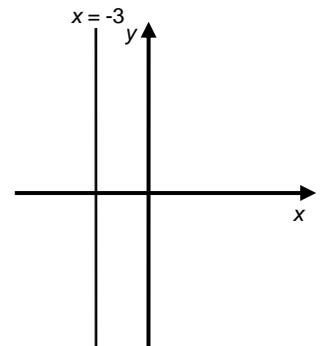
Example: Sketch the line $x = -3$.



Start with your axes



Add the x -intercept of -3



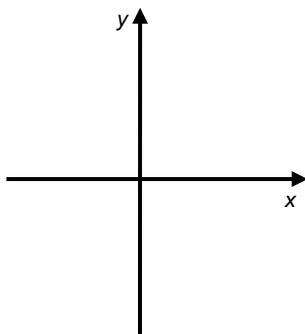
Draw and label the vertical line to complete the sketch

When you are sketching diagonal lines of the form $y = mx + c$ you need two pieces of information about the graph to complete the sketch.

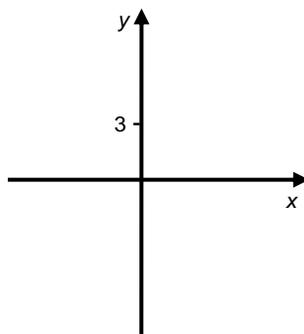
iii. Diagonal Lines: Equations of the type $y = mx + c$ where m is the gradient and c is the y -intercept (method using the gradient m and the intercept c).

This method uses the value of c (the y -intercept) as a fixed point on the sketch and then uses the value of m (the gradient) to decide whether the graph goes uphill or downhill. **Remember that you must include the sign of m and c in your analysis.** Positive gradients give uphill graphs and negative gradients give downhill graphs. In addition to this, if the value of m is greater than 1 then the graph is steeper than 45° and if the value of m is less than -1 then the graph is steeper than -45° . You can then draw the line with a ruler.

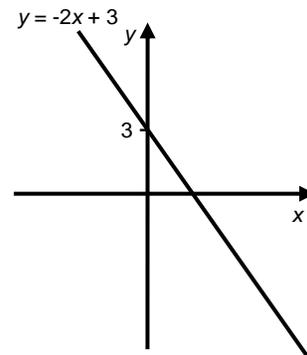
Example: Sketch the graph of $y = -2x + 3$.



Start with your axes



Add the y -intercept of 3



As the gradient is negative (-2), the line goes downhill

iv. Diagonal Lines: Equations of the type $y = mx + c$ where m is the gradient and c is the y -intercept (method using the x - and y -intercepts).

This method uses the value of c (the y -intercept) and the value of the x -intercept. You can find the value of the x -intercept by setting the value of y in $y = mx + c$ to zero and then rearranging the result for x . You do this by subtracting c from each side and then dividing by m as follows:

$$mx + c = 0$$

$$mx = -c$$

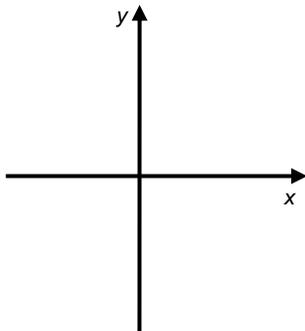
$$x = -\frac{c}{m}$$

Remember that you must include the sign of m and c in your calculation. Once you have the values of the intercepts, you mark them on your sketch and then draw the line which goes through them both using a ruler.

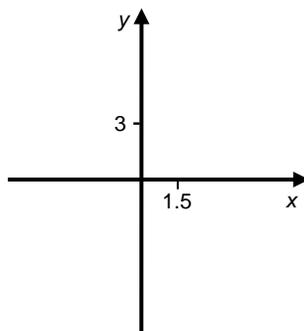
Example: Sketch the graph of $y = -2x + 3$.

To sketch this graph you need to calculate the x-intercept. The x-intercept is given by:

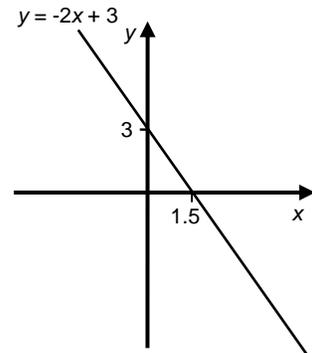
$$-\frac{c}{m} = -\frac{3}{-2} = 1.5$$



Start with your axes



Add the y-intercept of 3
and the x-intercept of 1.5



Drawn a line through the
two points using a ruler

Want to know more?

If you have any further questions about this topic you can make an appointment to see a **Learning Enhancement Tutor** in the **Student Support Service**, as well as speaking to your lecturer or adviser.

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- 💻 Ask: ask.let@uea.ac.uk
- 🔗 Click: <https://portal.uea.ac.uk/student-support-service/learning-enhancement>

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