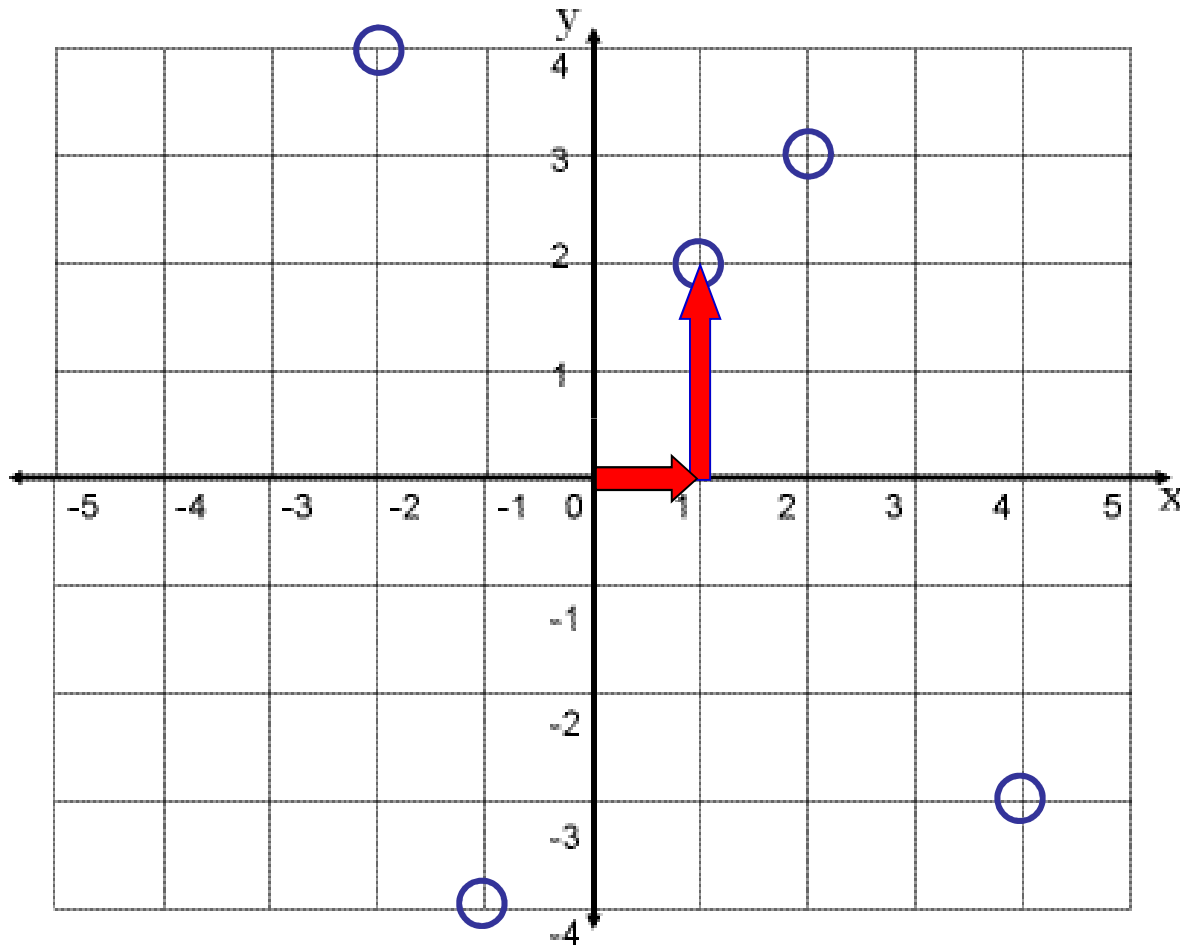


Graphs for GCSE Maths

x and y co-ordinates

Let's draw a grid and add scale numbers ...



So, that's co-ordinates.

Lets look at connecting them together ...

Every point on the grid can be found with two numbers.

One along the *vertical* scale labelled **y** and one on the *horizontal* scale labelled **x**

These are called **co-ordinates** **(x, y)**

So **(1,2)** is *one* along the x scale from zero and *two* along the y scale from zero

Where is (2, 3)?

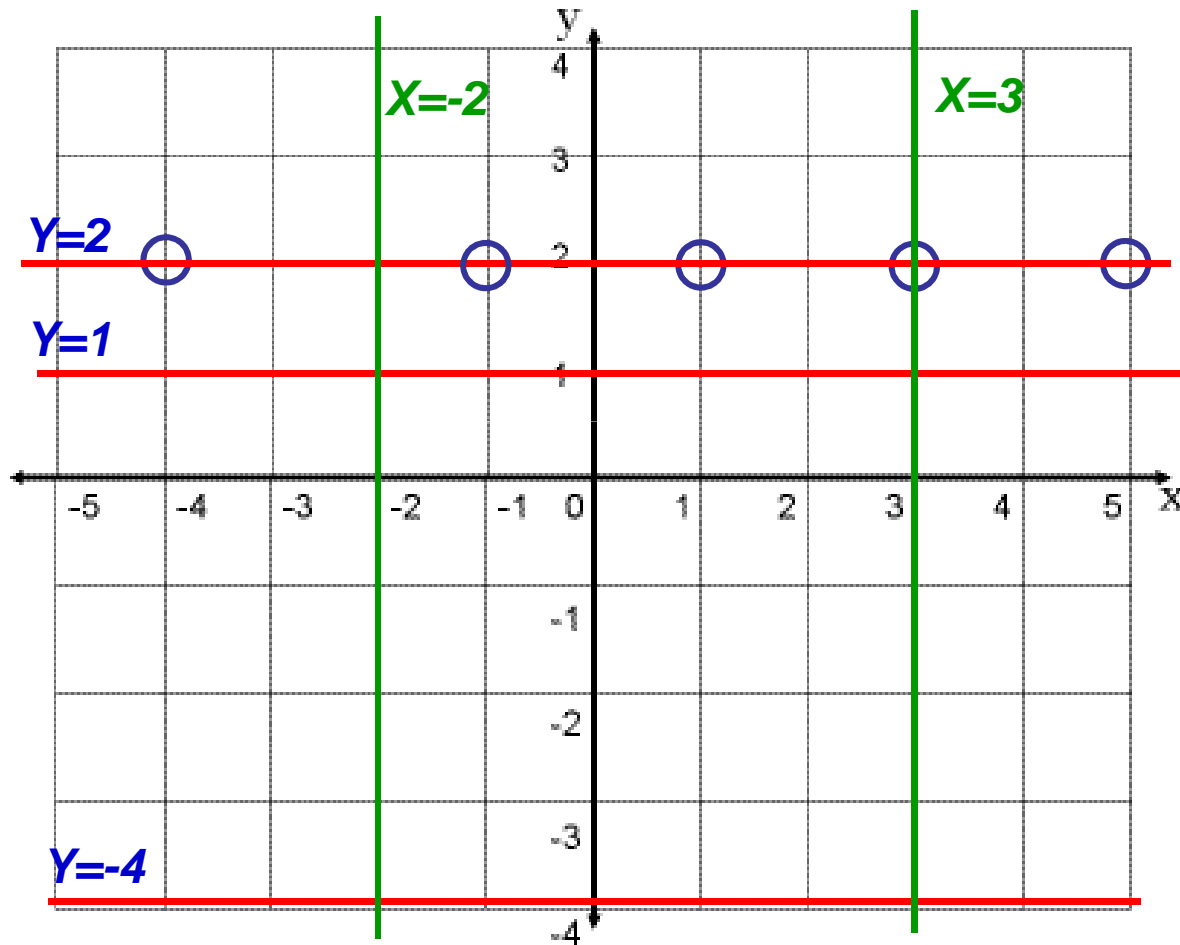
Or (-2, 4)

Or (-1,-4)

Or (4,-3)

Connecting co-ordinates – line equations

Lets think about the co-ordinates where $y = 2$. What could they be?



$(1,2), (3,2), (5,2) (-1,2), (-4, 2)$

If we connect these points we get a horizontal line and everywhere along the line $y=2$.

So, the line equation is $Y=2$

Draw the line $y=1$

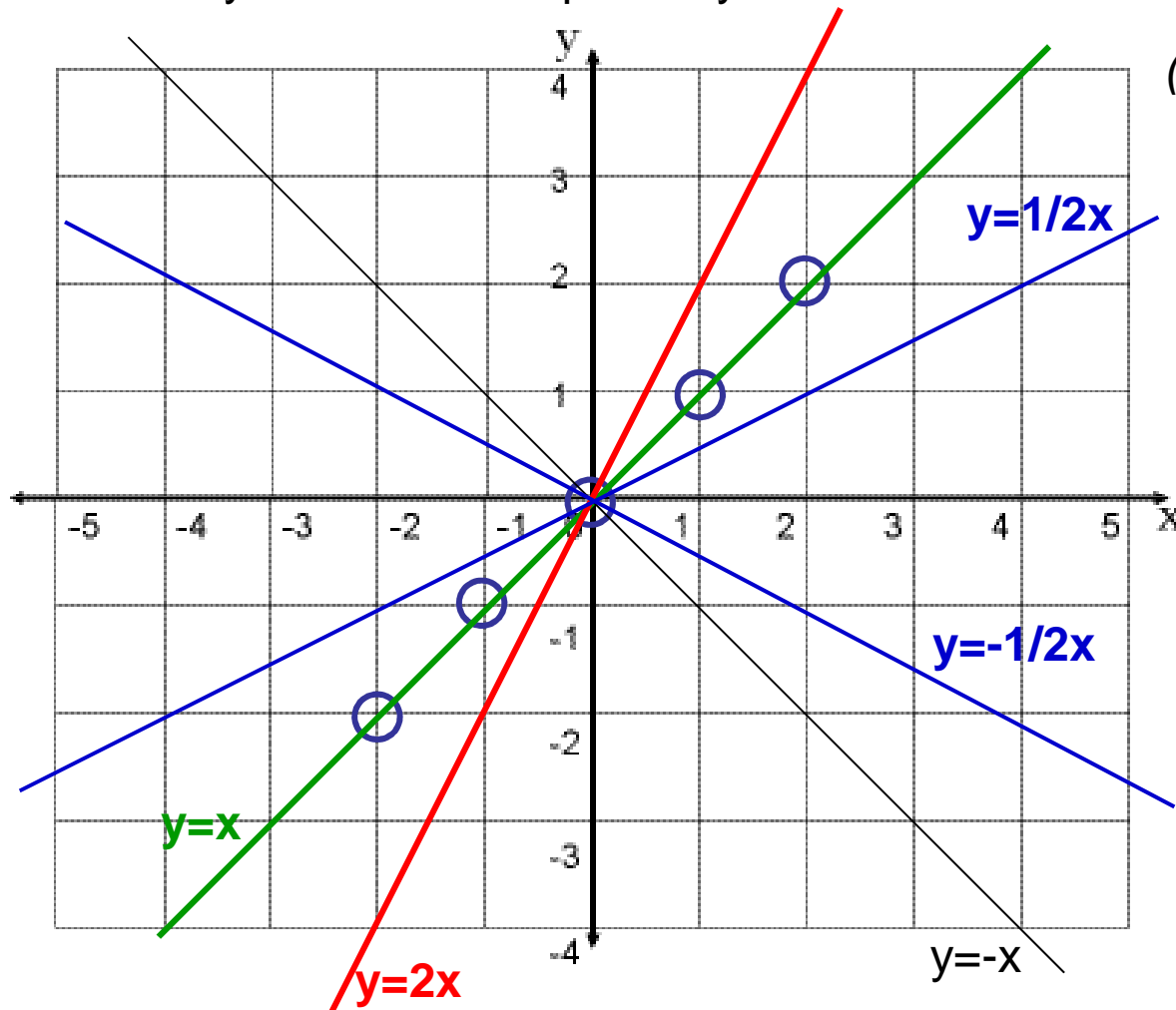
Or $y=-4$

Now try $x=3$
and $x=-2$

We have drawn simple equations , Lets look at equations that link x and y together ...

Line equations connecting x and y

Lets say we have an equation $y=x$. Give some co-ordinates on this line.



$(0,0), (1,1), (2,2), (-1,-1), (-2,-2)$

Draw this line equation

So, $y=x$ is at 45° clockwise from the y scale

Draw the line $y=2x$

Or $y=-x$

Now try

$y=1/2 x$

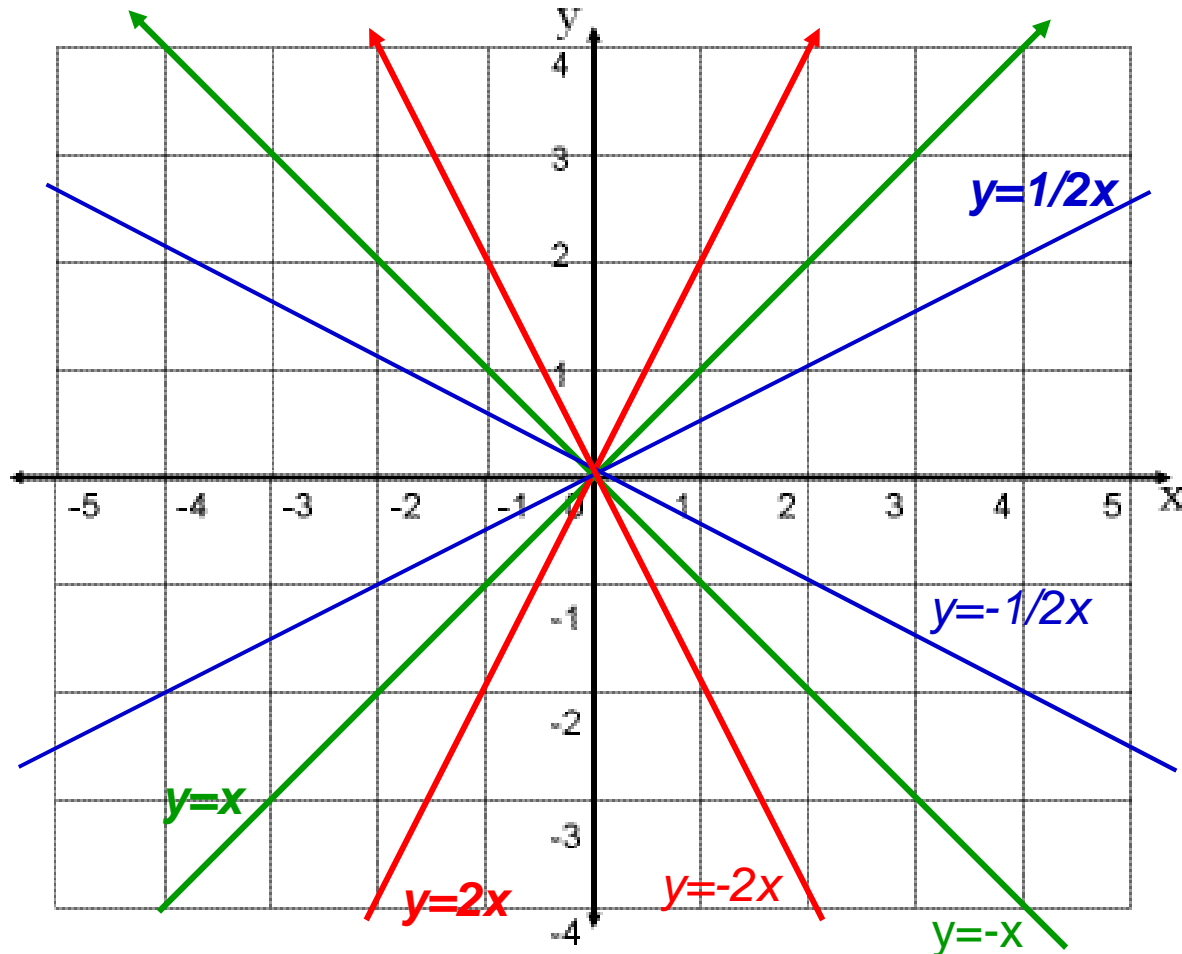
Or $y= -1/2x$

Notice that as the number in front of x gets bigger the line gets steeper.

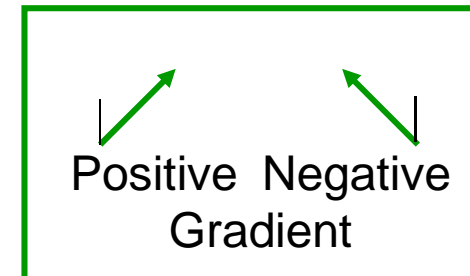
This is the **GRADIENT**. For $y=x$, gradient = 1, $y=2x$, gradient = 2

Working out the Gradient $y=mx$

What are the gradients of the lines below

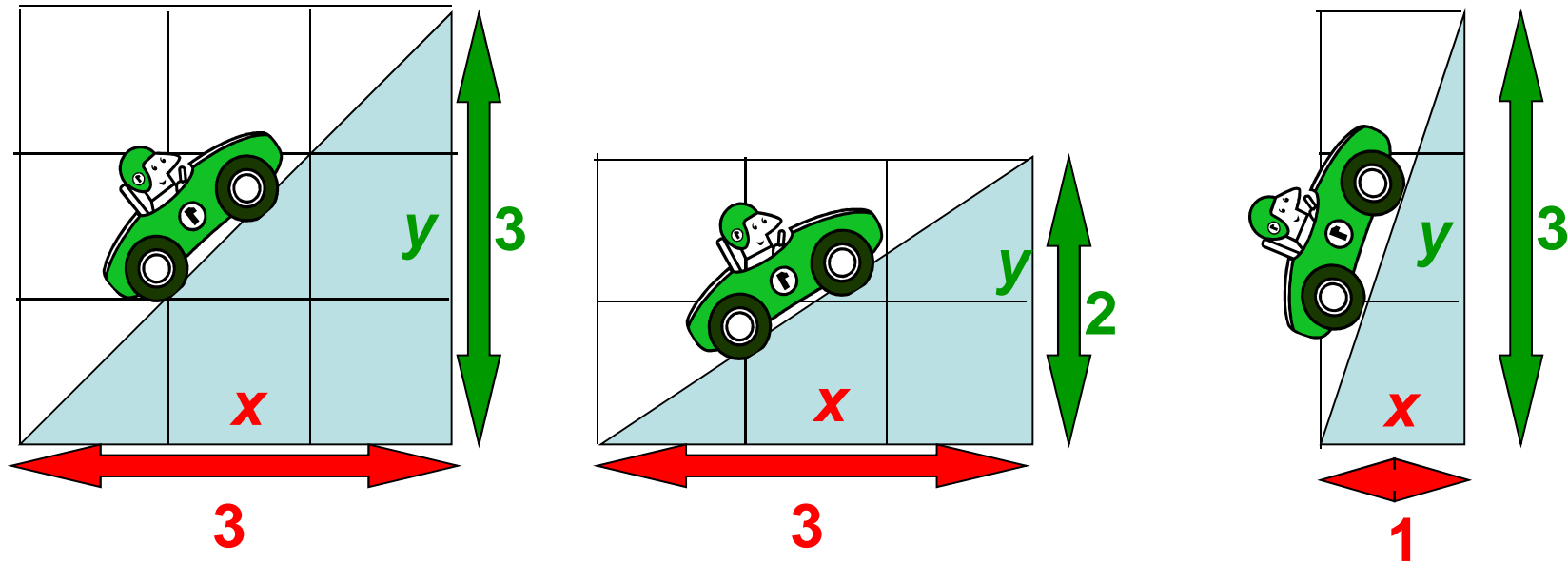


Equation	Gradient
$y=x$	1
$y=-x$	-1
$y=2x$	2
$y=-2x$	-2
$y=\frac{1}{2}x$	$\frac{1}{2}$
$y=-\frac{1}{2}x$	$-\frac{1}{2}$



Notice that $y=-x$ has a negative gradient of 45° anticlockwise from the y scale
Negative gradients point to the left, positive gradients point to the right

Gradient means steepness



$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{3}{3}$$

$$\text{Gradient} = 1$$

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{2}{3}$$

$$\text{Gradient} = 2/3$$

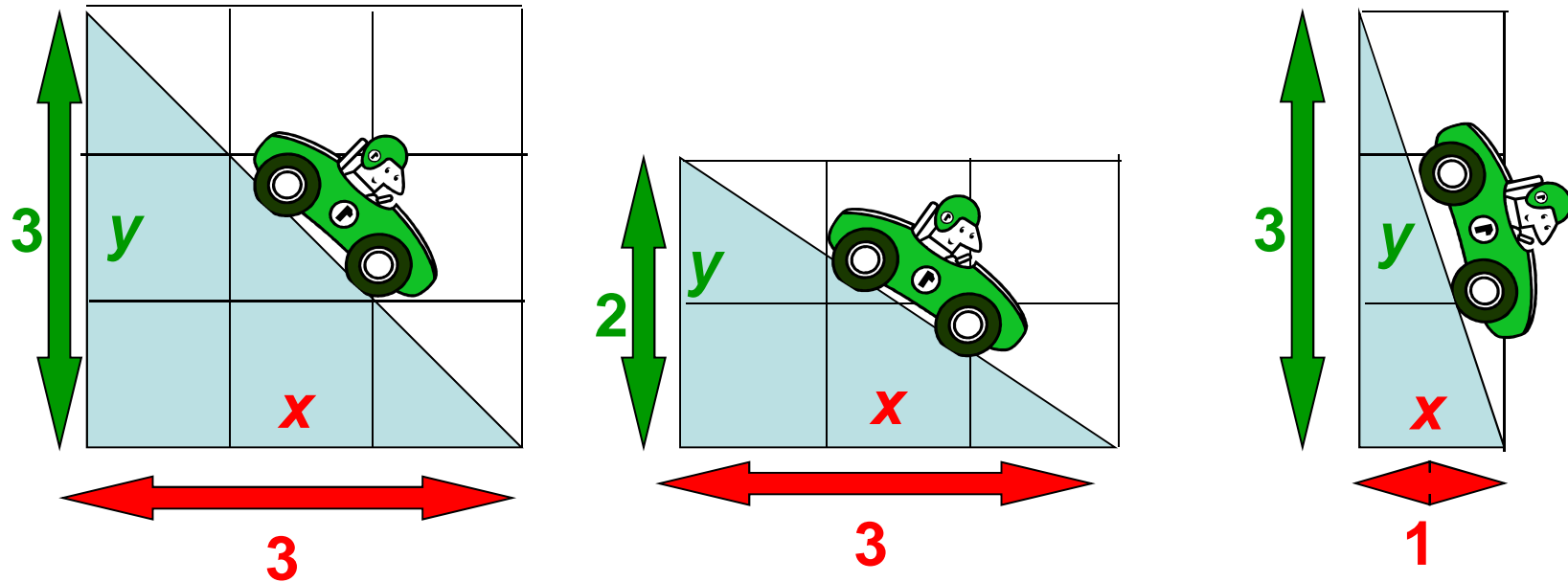
$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{3}{1}$$

$$\text{Gradient} = 3$$

Gradient = change in vertical divided by change in horizontal

Gradient can be negative



$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{3}{3}$$

$$\text{Gradient} = -1$$

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{2}{3}$$

$$\text{Gradient} = -2/3$$

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{3}{1}$$

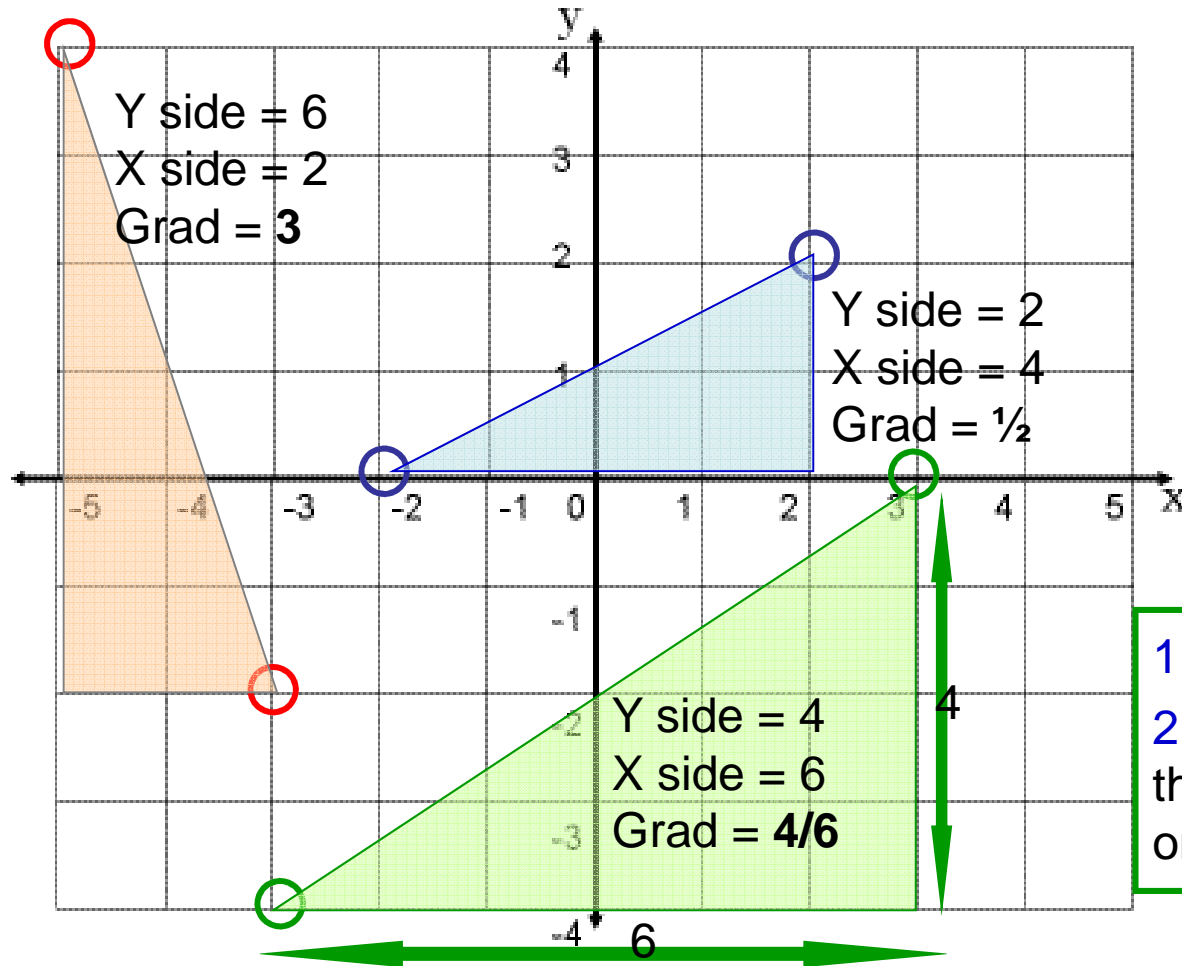
$$\text{Gradient} = -3$$

Gradient = change in vertical divided by change in horizontal

Find the gradient from two points

Work out the gradients of these pairs of co-ordinates

n.b. Gradient = $\frac{\text{change in } y}{\text{change in } x}$



(2,2) and (-2,0)

(-3,-4) and (3,0)

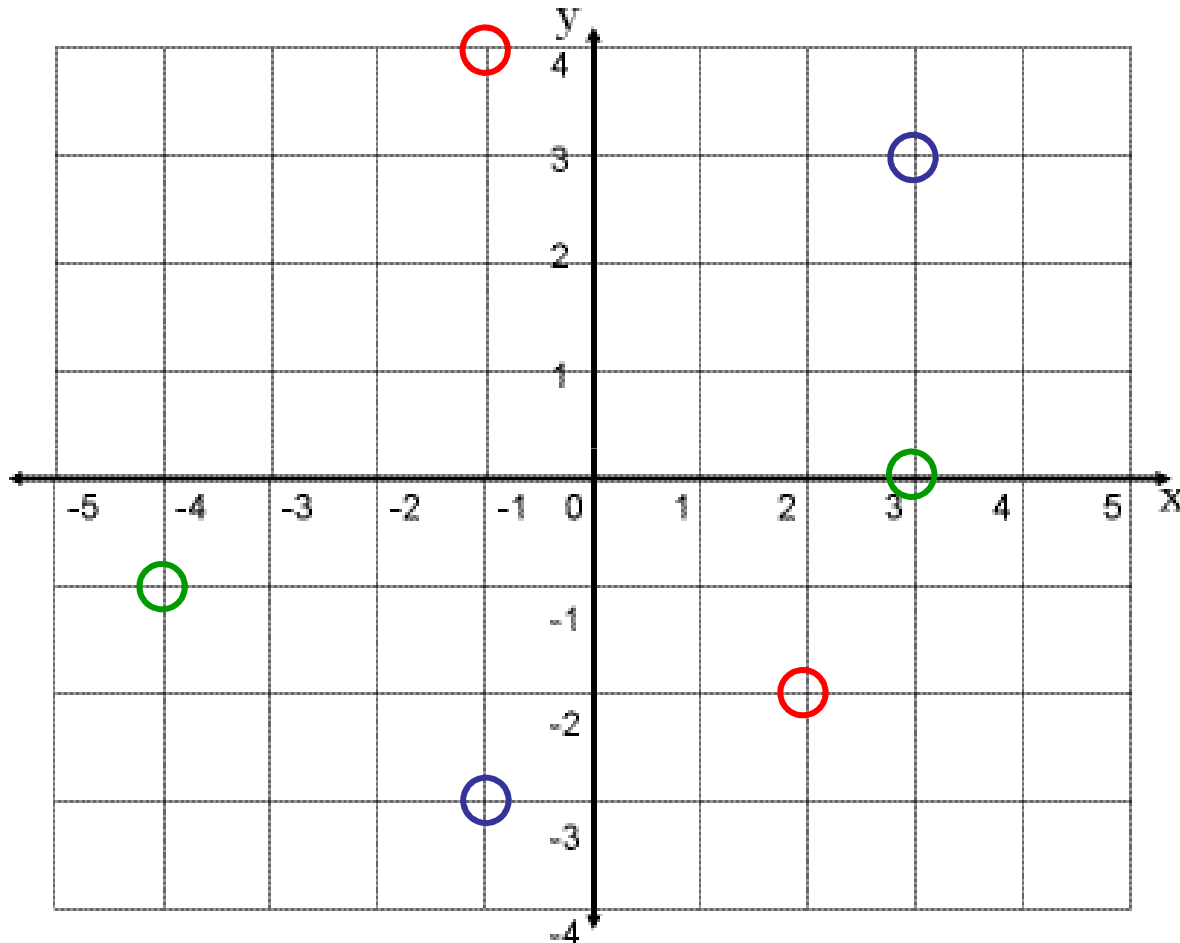
(-5,4) and (-3,-2)

1. Draw a triangle as shown
2. Note the length of the x side and the y side of the triangle and divide one by the other to get the gradient

Which gradient is negative?

Your turn - Find the gradient from two points

Work out the gradients of these pairs of co-ordinates



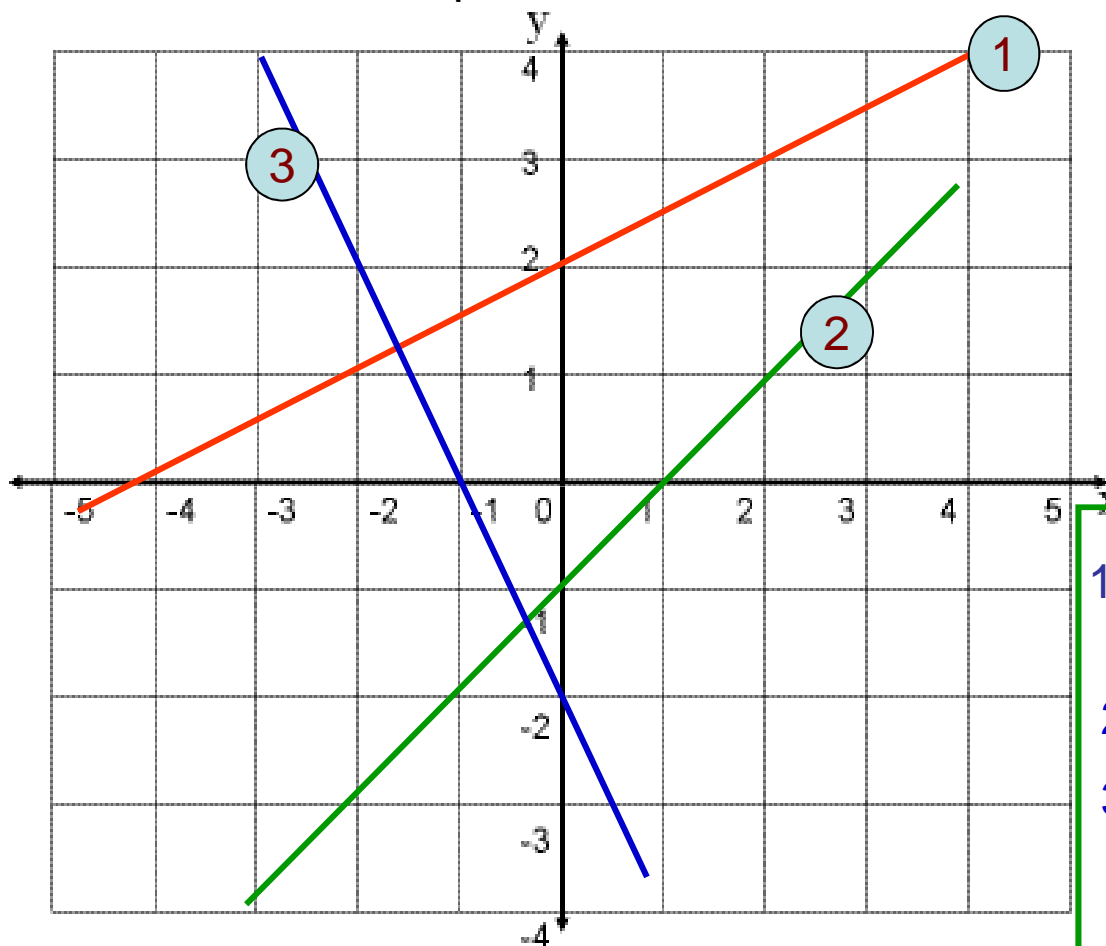
(3,3) and (-1,-3)

(-4,-1) and (3,0)

(-1,4) and (2,-2)

Working out the equation of a line $y=mx+c$

Work out the equations of these lines



	Crosses Y	Gradient Y/X	Equation
①	2	1/2	$Y=\frac{1}{2}x + 2$
②	-1	1	$Y=x - 1$
③	-2	-2	$Y=-2x - 2$

1. Record where it crosses the y scale. This is called c
2. Work out the gradient, called m
3. Put the two together as:

$$Y = mx + c$$

So you can find the equation of a line by using its gradient and where it crosses the Y scale and putting them in the equation $y=mx+c$

Match the equations

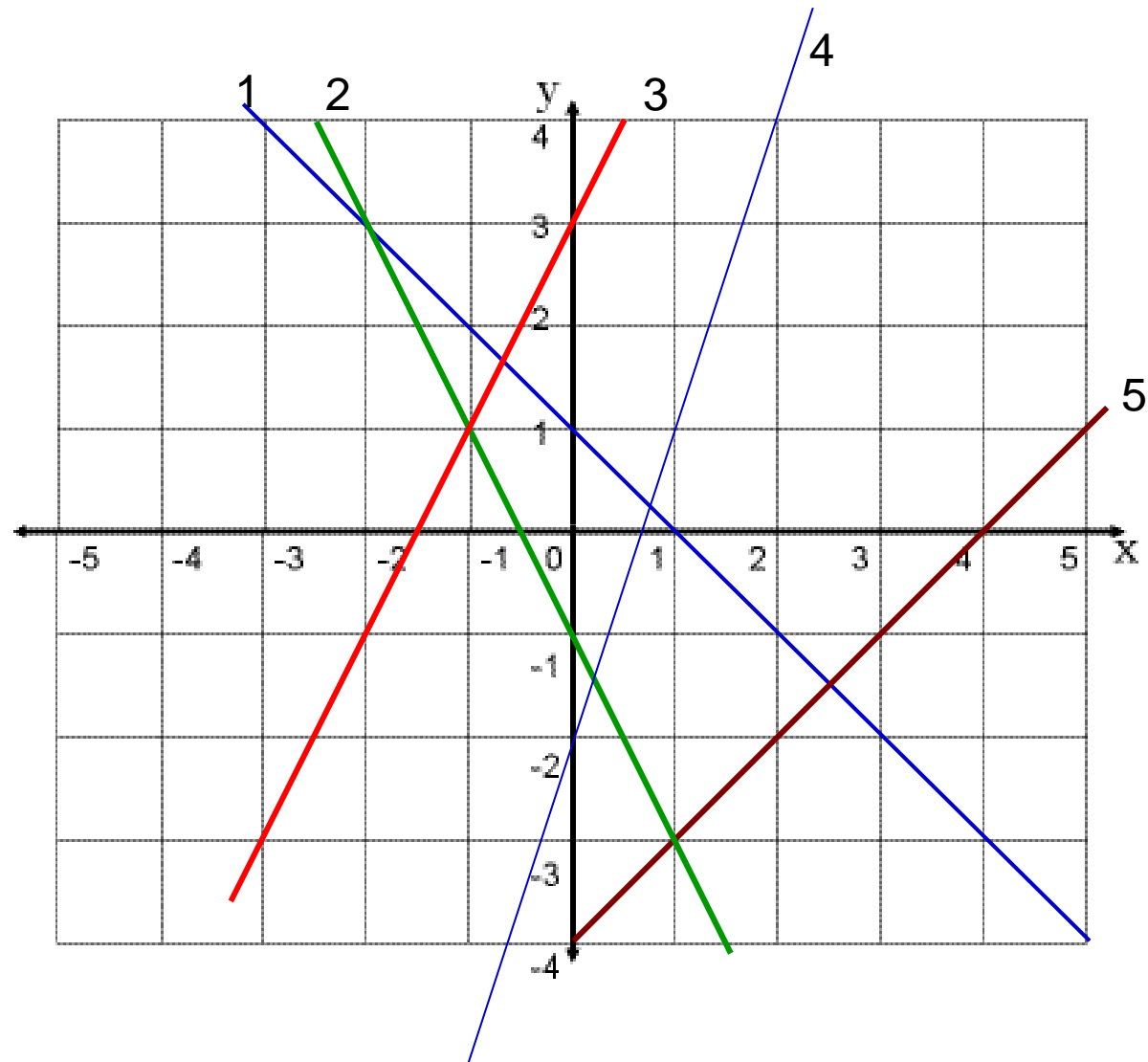
$$y=x-4$$

$$y=2x+3$$

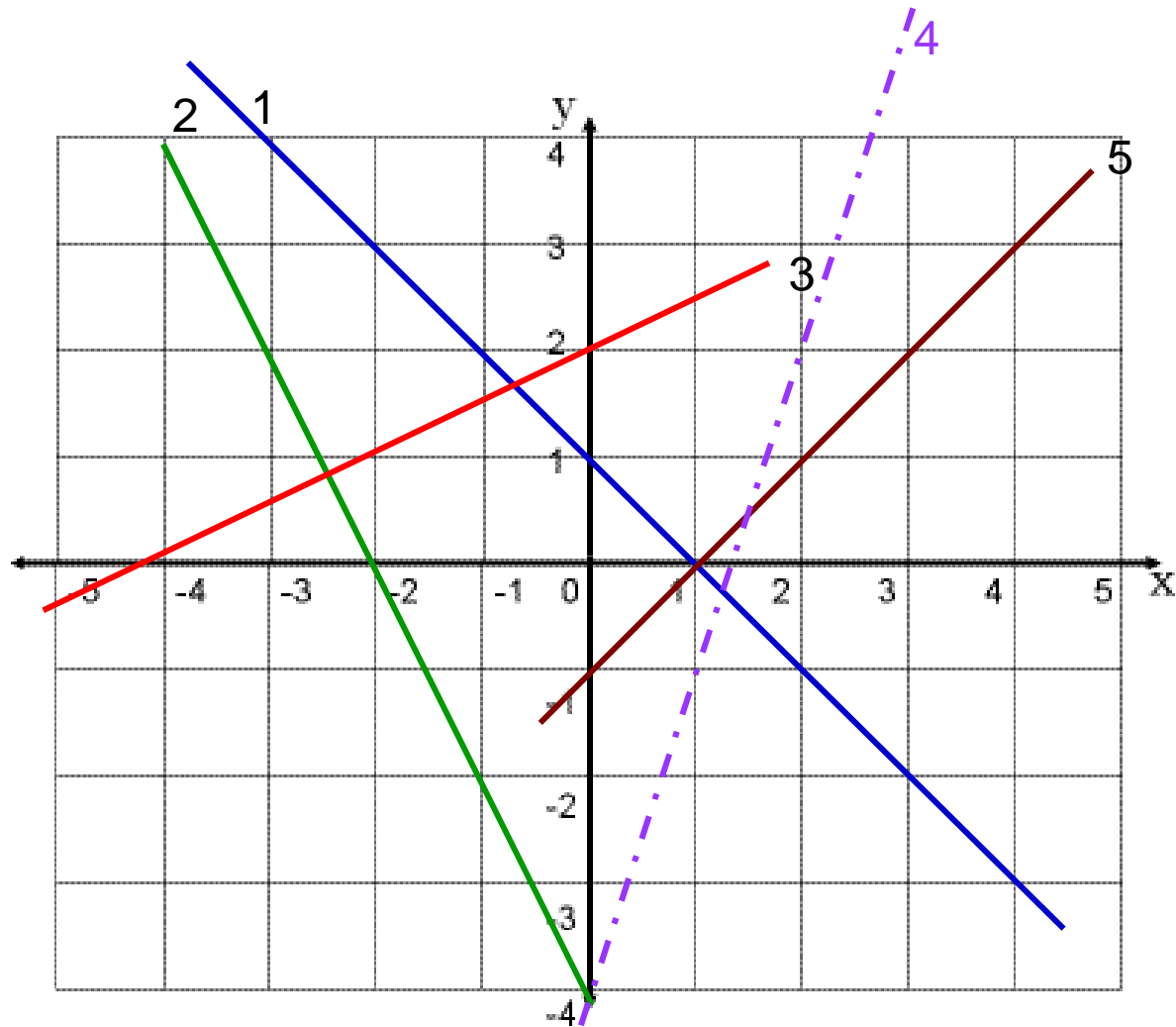
$$y=-x+1$$

$$y=-2x-1$$

$$y=3x-2$$



Your Turn - What's the equations



Notice the gradients when lines are at right angles or perpendicular (2 & 3)