Tishk International University
Faculty of Administrative Sciences and Economics

MATHEMATICS
FOR ECONOMICS AND BUSINESS

BUS 143
Part 3

I Grade- Fall

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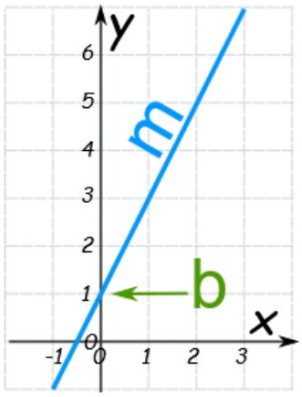
Equation of a Straight Line

The equation of a straight line is usually written this way:

$$y = mx + b$$

(or "y = mx + c" in the UK see below)

What does it stand for?



$$y = mx + b$$

Slope or Gradient

y when x=0 *(see Y Intercept)*

y = how far up

x = how far along

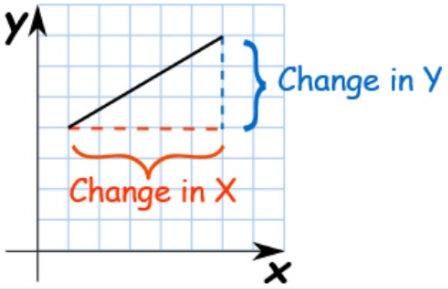
m = Slope or Gradient (how steep the line is)

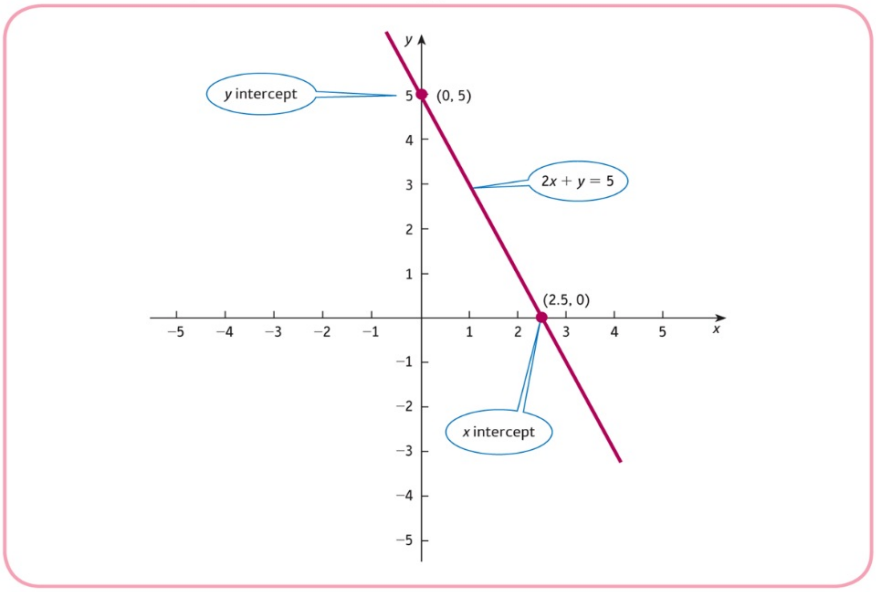
b = value of **y** when **x=0**

How do you find "m" and "b"?

- b is easy: just see where the line crosses the Y axis.
- m (the Slope) needs some calculation:

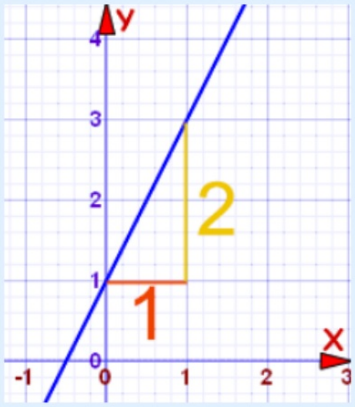
$$\mathbf{m} = \frac{\text{Change in Y}}{\text{Change in X}}$$





Knowing this we can work out the equation of a straight line:

Example 1



$$m = \frac{2}{1} = 2$$

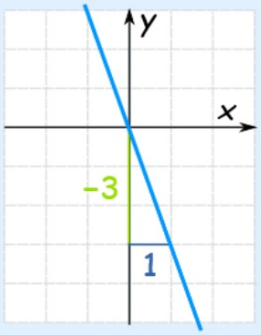
b = 1 *(value of **y** when x=0)*

So: y = 2x + 1

Positive or Negative Slope?

Going from left-to-right, the cyclist has to **P**ush on a **P**ositive Slope:

Example 2



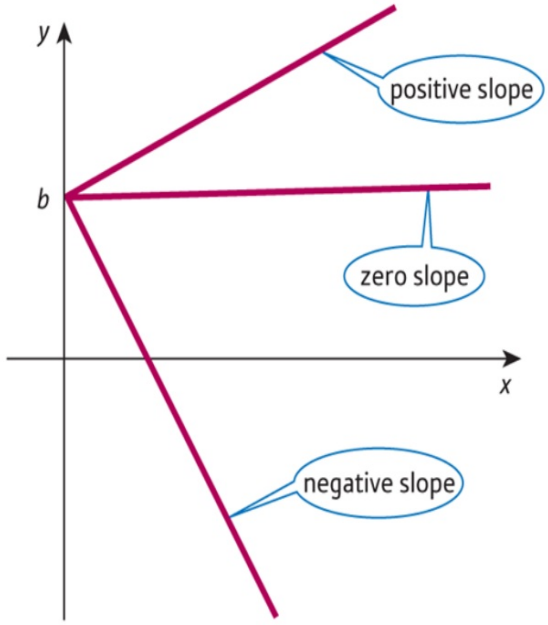
$$m = \frac{-3}{1} = -3$$

$$b = 0$$

This gives us **y = −3x + 0**

We do not need the zero!

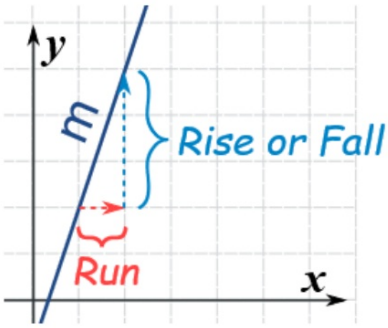
So: $y = -3x$


y
b
x
positive slope
zero slope
negative slope

Rise and Run

Sometimes the words "rise" and "run" are used.

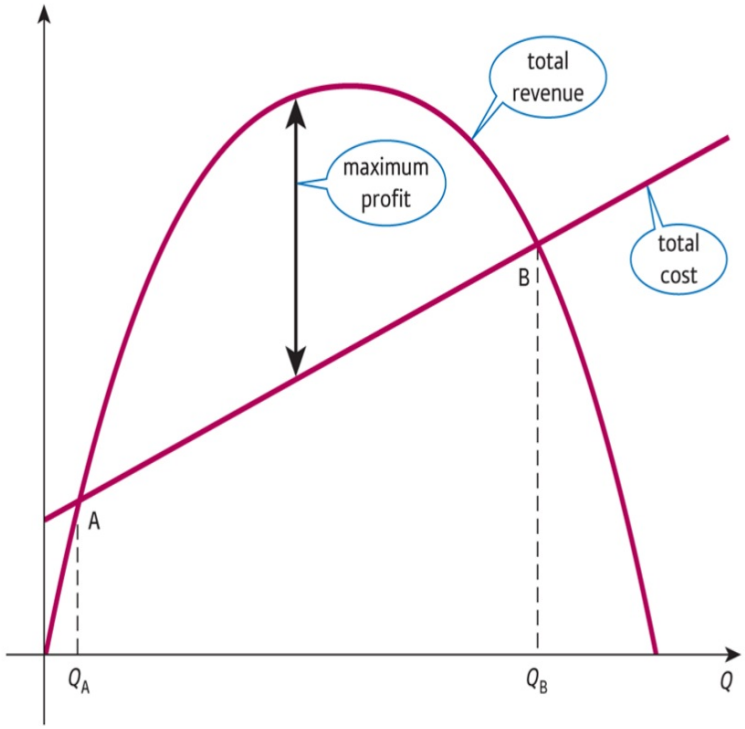
- Rise is how far up
- Run is how far along



And so the slope "m" is:

$$m = \frac{\text{rise}}{\text{run}}$$

You might find that easier to remember.


total
revenue
maximum
profit
total
cost
B
A
Q_A
Q_B
Q

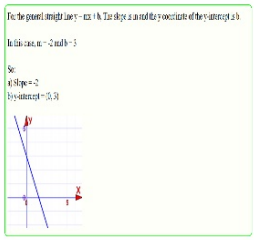
For the straight line **y = -2x + 3**, what are:
a) the slope
b) the y-intercept?

A a) Slope = 2
b) y-intercept = (0, -3)

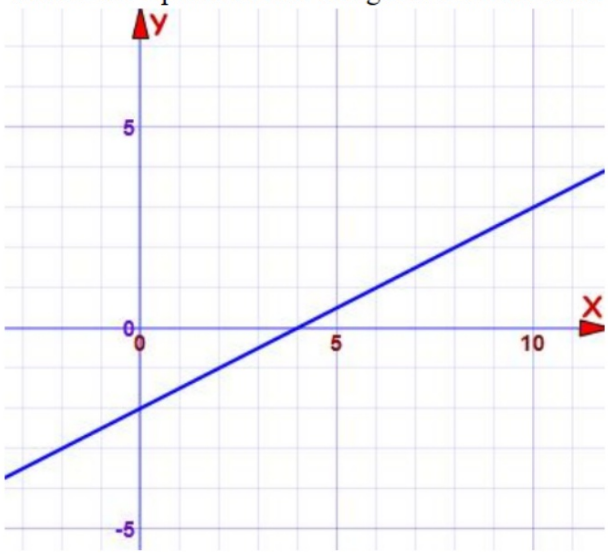
B a) Slope = -2
b) y-intercept = (0, 3)

C a) Slope = 3
b) y-intercept = (0, -2)

D a) Slope = -3
b) y-intercept = (0, 2)



What is the equation of the straight line shown in the diagram?

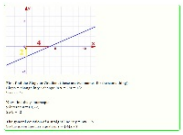


A $y = 2x - 2$

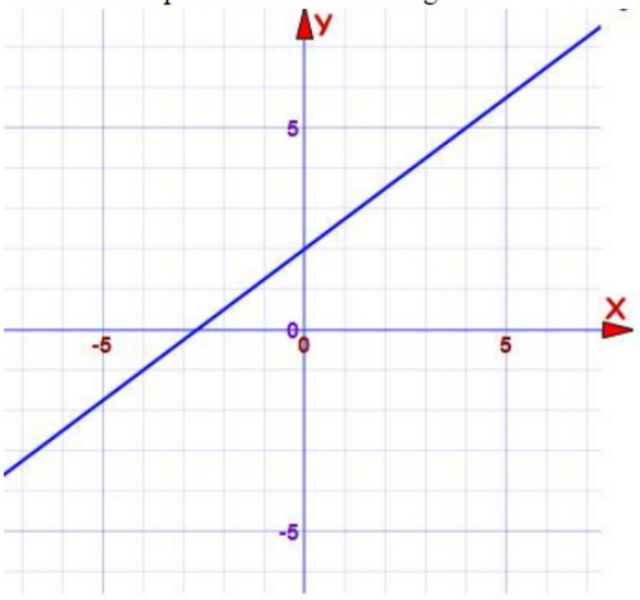
B $y = -2x + \frac{1}{2}$

C $y = -(\frac{1}{2})x + 2$

D $y = (\frac{1}{2})x - 2$



What is the equation of the following line?



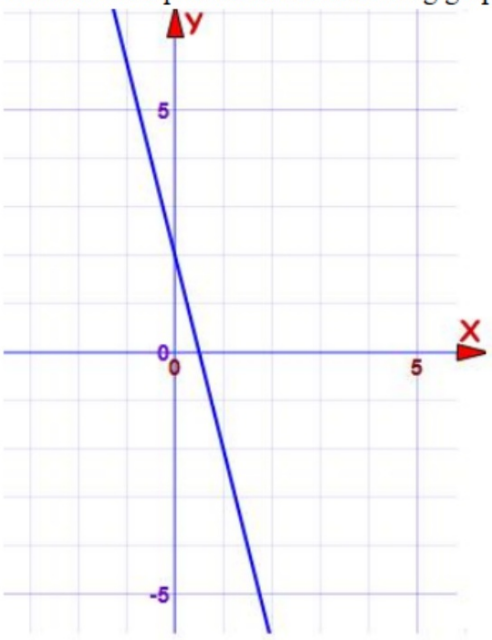
A $y = -1.33x + 2$

B $y = 1.33x + 2$

C $y = -0.75x + 2$

D $y = 0.75x + 2$

What is the equation of the following graph?

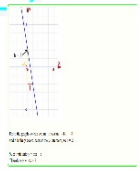


A $y = -4x + 2$

B $y = 4x + 2$

C $y = -0.25x + 2$

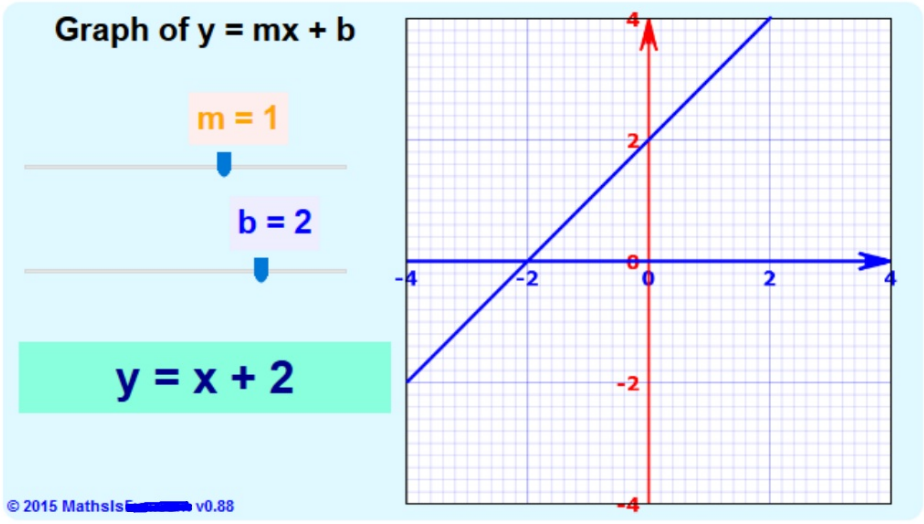
D $y = 0.25x + 2$



Explore the Properties of a Straight Line Graph

Move the **m** and **b** slider bars to explore the properties of a straight line graph. Look at

- The effect of changes in m
- The effect of changes in b
- The effect of a negative value of m
- The effect of a negative value of b
- How to create a horizontal line



For the straight line $\mathbf{x} = \mathbf{2y} - \mathbf{3}$, what are:
a) the slope
b) the y-intercept?

A Slope = 2 and y-intercept = (0, -3)

B Slope = ½ and y-intercept = (0, 1½)

C Slope = -½ and y-intercept = (0, 1½)

D Slope = ½ and y-intercept = (0, -1½)

Linear Equations

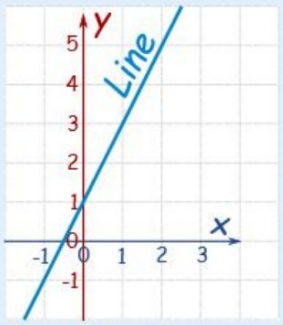
A **linear** equation is an equation for a straight **line**

These are all linear equations:

- ✓ $y = 2x + 1$
- ✓ $5x = 6 + 3y$
- ✓ $y/2 = 3 - x$

Let us look more closely at one example:

Example: $y = 2x + 1$ is a linear equation:



The graph of $y = 2x+1$ is a straight line

- When x increases, y increases **twice as fast**, so we need $2x$
- When x is 0, y is already 1. So $+1$ is also needed
- And so: $y = 2x + 1$

Here are some example values:

x	y = 2x + 1
-1	y = 2 × (-1) + 1 = **-1**
0	y = 2 × 0 + 1 = **1**
1	y = 2 × 1 + 1 = **3**
2	y = 2 × 2 + 1 = **5**

Check for yourself that those points are part of the line above!

Different Forms

There are many ways of writing linear equations, but they usually have **constants** (like "2" or "c") and must have simple **variables** (like "x" or "y").

Examples: These are linear equations:

- ✓ $y = 3x - 6$
- ✓ $y - 2 = 3(x + 1)$
- ✓ $y + 2x - 2 = 0$
- ✓ $5x = 6$
- ✓ $y/2 = 3$

But the variables (like "x" or "y") in Linear Equations do **NOT** have:

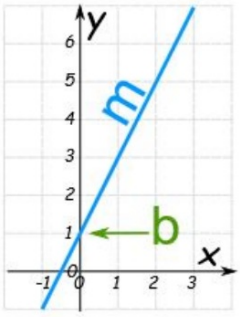
- Exponents (like the 2 in x^2)
- Square roots, cube roots, etc

Examples: These are NOT linear equations:

- ✗ $y^2 - 2 = 0$
- ✗ $3\sqrt{x} - y = 6$
- ✗ $x^3/2 = 16$

Slope-Intercept Form

The most common form is the slope-intercept equation of a straight line :



$$y = mx + b$$

Slope (or Gradient) Y Intercept

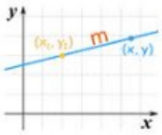
Example: y = 2x + 1

- Slope: **m = 2**
- Intercept: **b = 1**

Point-Slope Form

Another common one is the Point-Slope Form of the equation of a straight line:

$$y - y_1 = m(x - x_1)$$



Example: $y - 3 = (¼)(x - 2)$

It is in the form $\mathbf{y - y_1 = m(x - x_1)}$ where:

- $y_1 = 3$
- $m = ¼$
- $x_1 = 2$

General Form

And there is also the General Form of the equation of a straight line:

$$Ax + By + C = 0$$

(A and B cannot both be 0)

Example: 3x + 2y − 4 = 0

It is in the form **Ax + By + C = 0** where:

- A = 3
- B = 2
- C = −4

As a Function

Sometimes a linear equation is written as a function, with $f(x)$ instead of y:

$y = 2x - 3$
$f(x) = 2x - 3$
These are the same!

And functions are not always written using f(x):

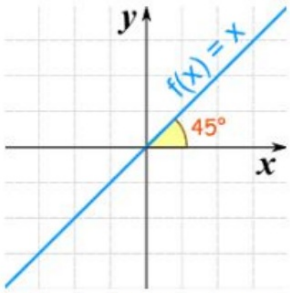
$y = 2x - 3$
$w(u) = 2u - 3$
$h(z) = 2z - 3$
These are also the same!

The Identity Function

There is a special linear function called the "Identity Function":

$$f(x) = x$$

And here is its graph:



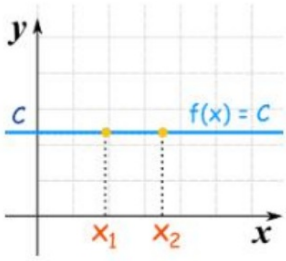
It makes a 45° (its slope is 1)

It is called "Identity" because what comes out is **identical** to what goes in:

In	Out
0	0
5	5
−2	−2
...etc	...etc

Constant Functions

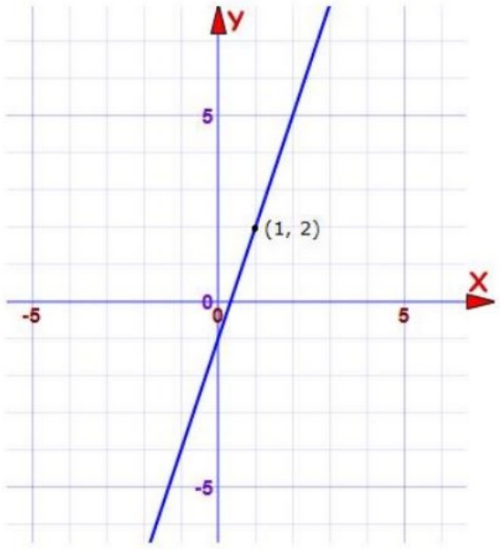
Another special type of linear function is the Constant Function ... it is a horizontal line:



f(x) = C

No matter what value of "x", f(x) is always equal to some constant value.

Using the given point, what is the equation of this straight line in Point-Slope Form?

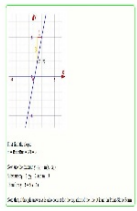


A $y = 3x - 1$

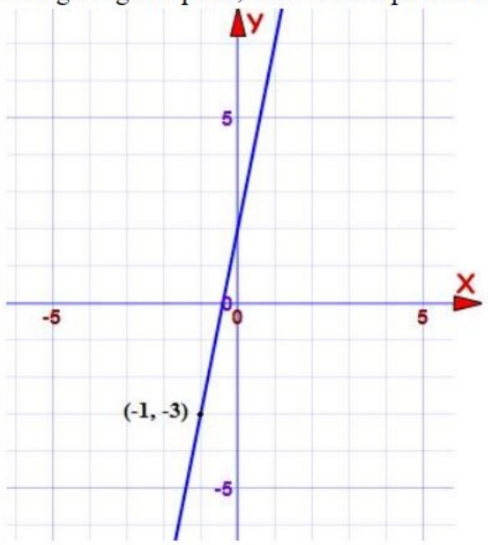
B $y - 2 = 1/3(x - 1)$

C $y - 2 = 3(x - 1)$

D $y - 1 = 3(x - 2)$



Using the given point, what is the equation of this straight line in Point-Slope Form?



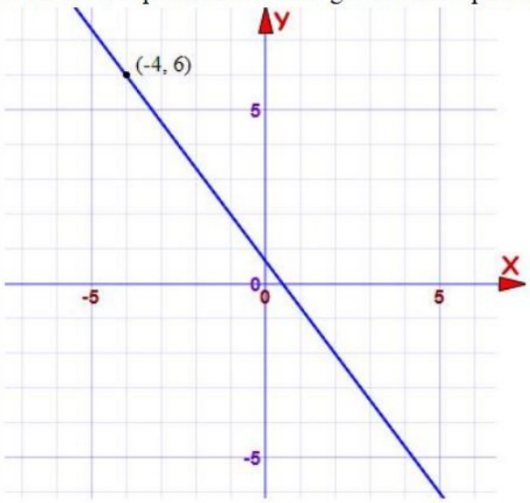
A $y = 5x + 2$

B $y - 3 = 5(x - (-1))$

C $y - (-3) = 5(x -(-1))$

D $y - (-3) = 5(x -1)$

What is the equation of this straight line in Slope-intercept Form?

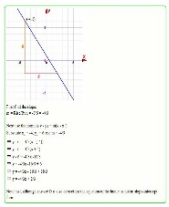


A $y = -4/3x + 2/3$

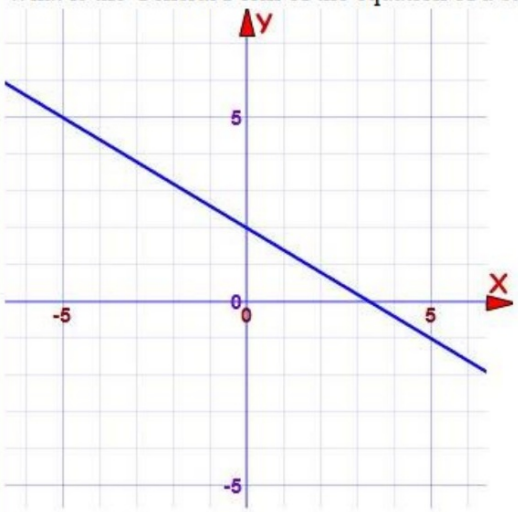
B $y = -4/3x + 32/3$

C $y = 4/3x + 2/3$

D $y - 6 = -4/3(x - (-4))$



What is the General Form of the equation of a straight line for this graph?

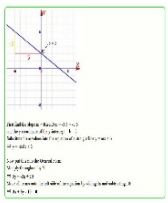


A $3x - 5y - 10 = 0$

B $3x + 5y - 10 = 0$

C $3y - 5x - 6 = 0$

D $3y + 5x - 6 = 0$



Point-Slope Equation of a Line

The "point-slope" form of the equation of a straight line is:

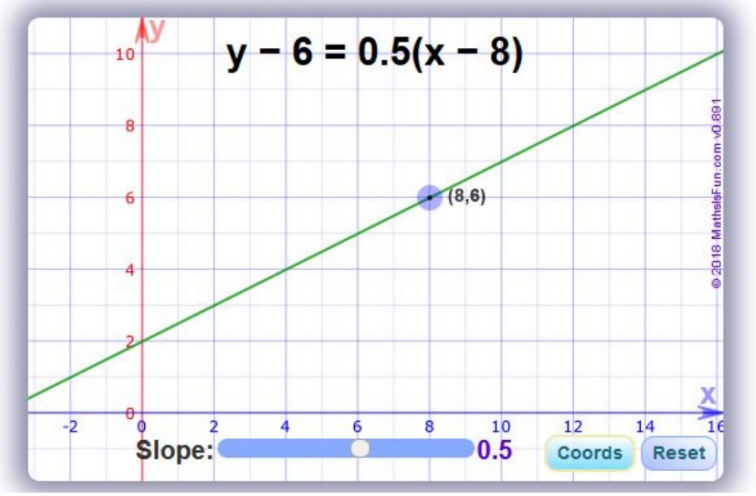
$$y - y_1 = m(x - x_1)$$

The equation is useful when we know:

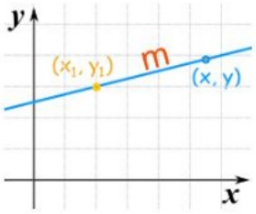
- one point on the line: (x_1, y_1)
- and the slope of the line: m,

and want to find other points on the line.

Have a play with it first (move the point, try different slopes):



What does it stand for?



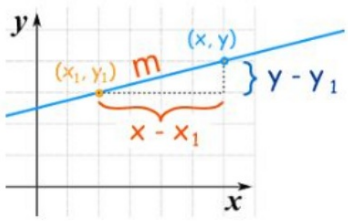
(x_1, y_1) is a **known** point

m is the **slope** of the line

(x, y) is any other point on the line

Making sense of it

It is based on the slope:



$$\text{Slope } m = \frac{\text{change in y}}{\text{change in x}} = \frac{y - y_1}{x - x_1}$$

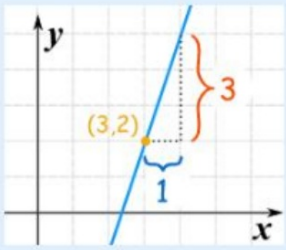
Starting with the slope: $\frac{y - y_1}{x - x_1} = m$

we rearrange it like this: $\frac{y - y_1}{x - x_1} = m(x - x_1)$

to get this: $y - y_1 = m(x - x_1)$

Now let us see how to use it.

Example 1:



$$\text{slope "m"} = \frac{3}{1} = 3$$

$$y - y_1 = m(x - x_1)$$

We know m, and also know that $(x_1, y_1) = (3,2)$, and so we have:

$$y - 2 = 3(x - 3)$$

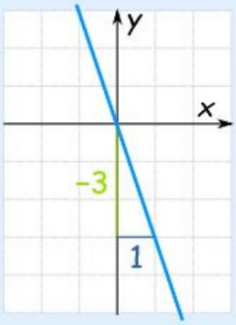
That is a perfectly good answer, but we can simplify it a little:

$$y - 2 = 3x - 9$$

$$y = 3x - 9 + 2$$

$$y = 3x - 7$$

Example 2:



$$m = \frac{-3}{1} = -3$$

$$y - y_1 = m(x - x_1)$$

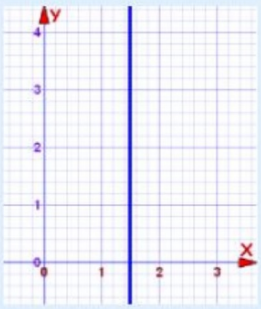
We can pick any point for (x_1, y_1), so let's choose $(0,0)$, and we have:

$$y - 0 = -3(x - 0)$$

Which can be simplified to:

$$y = -3x$$

Example 3: Vertical Line



What is the equation for a vertical line?
The slope is undefined!

In fact, this is a **special case**, and we use a different equation, like this:

$$x = 1.5$$

Every point on the line has **x** coordinate **1.5**,
that's why its equation is **x = 1.5**

What About y = mx + b ?

You may already be familiar with the "y=mx+b" form (called the slope-intercept form of the equation of a line).

It is the same equation, in a different form!

The "b" value (called the y-intercept) is where the line crosses the y-axis.

So point (x_1, y_1) is actually at $(0, b)$

and the equation becomes:

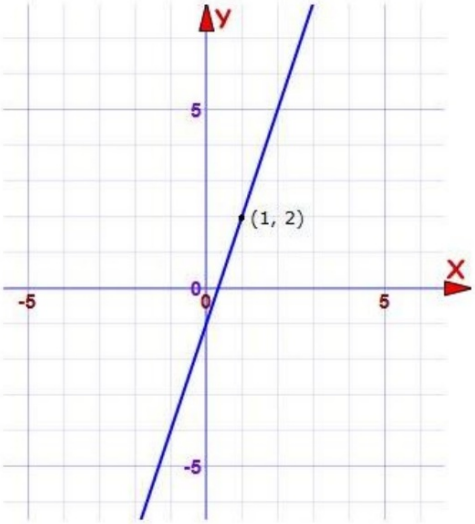
Start with $y - y_1 = m(x - x_1)$

(x_1, y_1) is actually $(0, b)$: $y - b = m(x - 0)$

Which is: $y - b = mx$

Put b on other side: $\mathbf{y = mx + b}$

Using the given point, what is the equation of this straight line in Point-Slope Form?

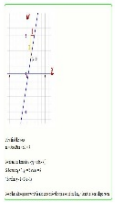


A $y = 3x - 1$

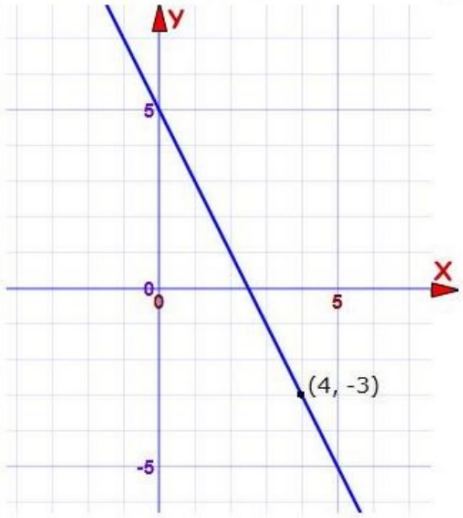
B $y - 2 = 1/3(x - 1)$

C $y - 2 = 3(x - 1)$

D $y - 1 = 3(x - 2)$



Using the given point, what is the Point-slope equation of this line?

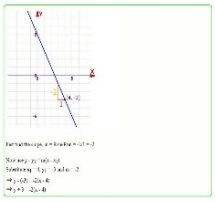


A $y + 3 = -2(x - 4)$

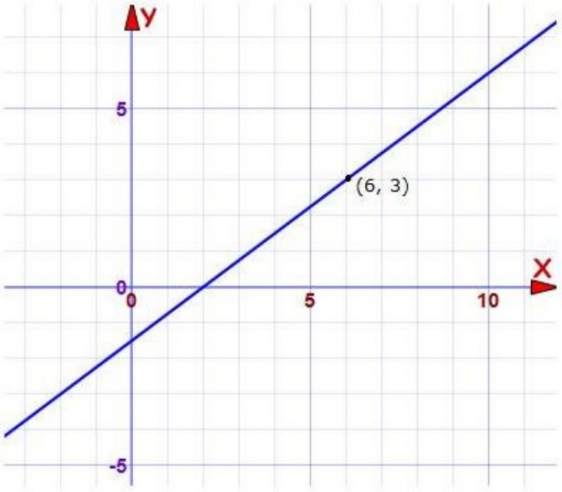
B $y - 3 = -2(x - 4)$

C $y + 3 = -1/2(x - 4)$

D $y - 3 = -1/2(x - 4)$



Using the given point, what is the Point-slope equation of this line?

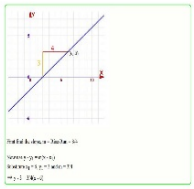


A $y - 3 = -4/3(x - 6)$

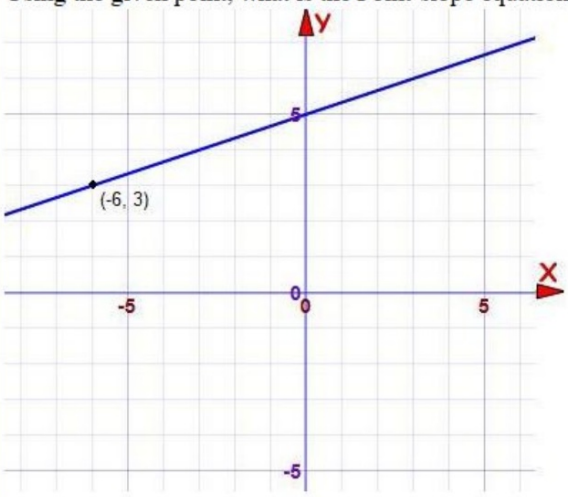
B $y - 3 = 4/3(x - 6)$

C $y - 3 = -3/4(x - 6)$

D $y - 3 = 3/4(x - 6)$



Using the given point, what is the Point-slope equation of this line?

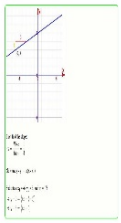


A $y + 6 = \frac{1}{3}(x - 3)$

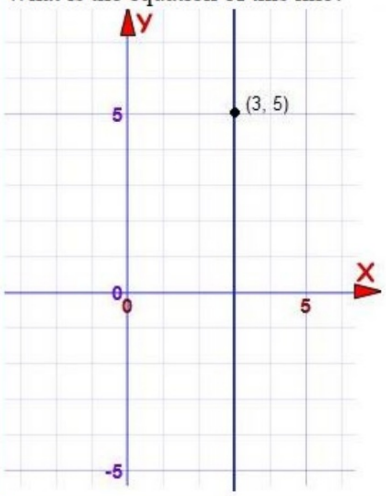
B $y - 3 = \frac{1}{3}(x - 6)$

C $y - 3 = 3(x + 6)$

D $y - 3 = \frac{1}{3}(x + 6)$



What is the equation of this line?



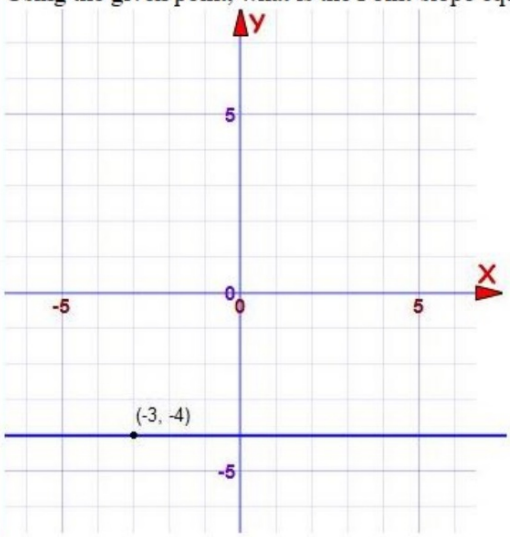
A $y - 5 = 1(x - 3)$

B $y - 5 = 0(x - 3)$

C $y = 3$

D $x = 3$

Using the given point, what is the Point-slope equation of this line?



A $y - 4 = 0(x + 3)$

B $y + 4 = 0(x + 3)$

C $y + 4 = 0(x - 3)$

D $y - 4 = 0(x - 3)$

This is a horizontal line, so the slope zero i.e. m=0

Now use the formula $y - y_1 = m(x - x_1)$

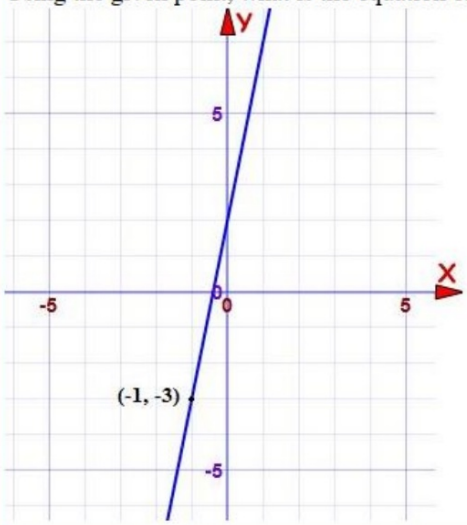
Substitute $x_1 = -3$, $y_1 = -4$ and $m = 0$

Therefore $y - (-4) = 0(x - (-3))$

$\Rightarrow y + 4 = 0(x + 3)$

Note that this simplifies to $y = -4$

Using the given point, what is the equation of this straight line in Point-Slope Form?

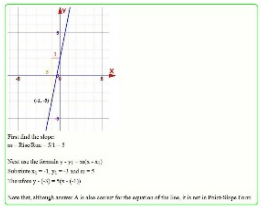


A $y = 5x + 2$

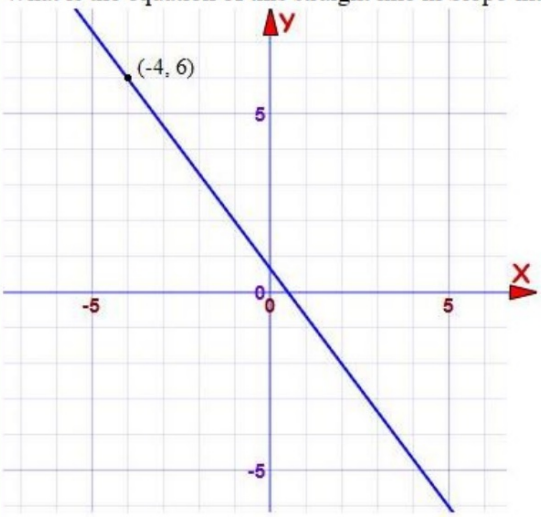
B $y - 3 = 5(x - (-1))$

C $y - (-3) = 5(x -(-1))$

D $y - (-3) = 5(x -1)$



What is the equation of this straight line in Slope-intercept Form?

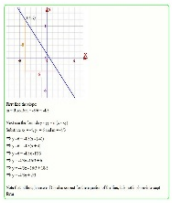


A $y = -4/3x + 2/3$

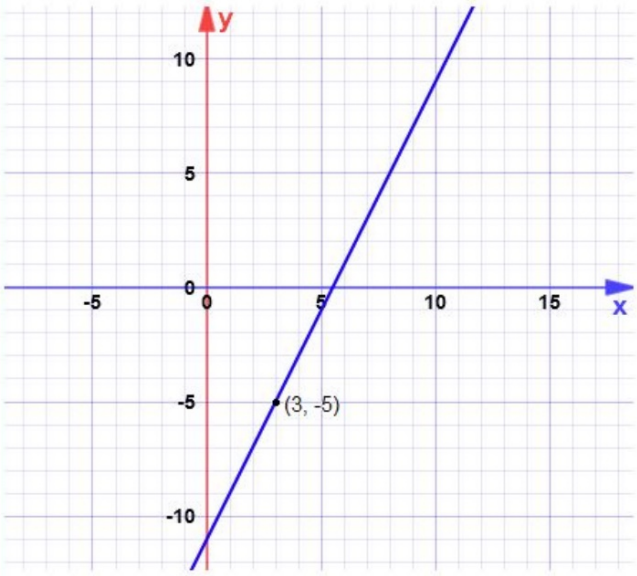
B $y = -4/3x + 32/3$

C $y = 4/3x + 2/3$

D $y - 6 = -4/3(x - (-4))$



Using the given point, what is the Point-slope equation of this line?

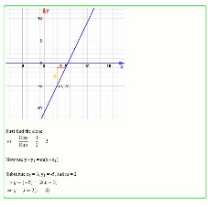


A $y + 5 = -2(x - 3)$

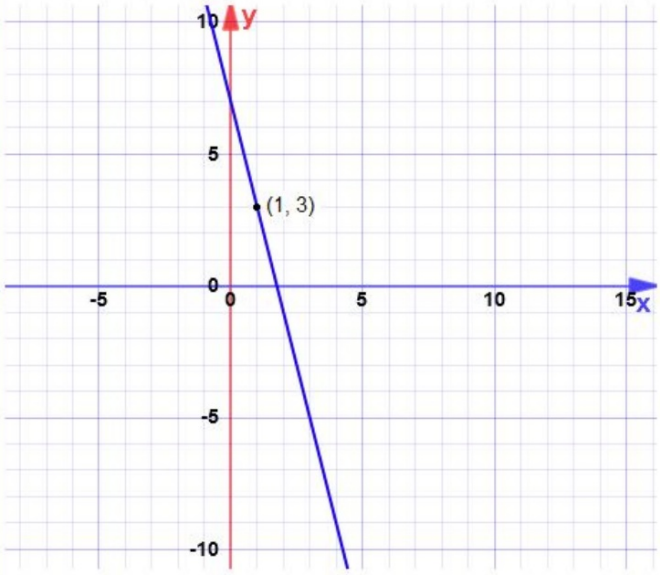
B $y + 5 = 2(x - 3)$

C $y - 5 = 2(x - 3)$

D $y + 5 = 2(x + 3)$



Using the given point, what is the Point-slope equation of this line?

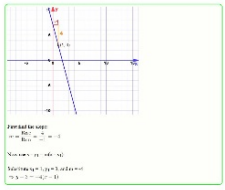


A $y - 3 = -4(x + 1)$

B $y - 3 = 4(x - 1)$

C $y - 3 = -4(x - 1)$

D $y + 3 = -4(x - 1)$



General Form of Equation of a Line

The "General Form" of the equation of a straight line is:

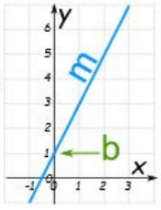
$$Ax + By + C = 0$$

A or B can be zero, but not both at the same time.

The General Form is not always the most useful form, and you may prefer to use:

The Slope-Intercept Form of the equation of a straight line:

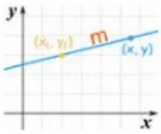
$$y = mx + b$$



or

The Point-Slope Form of the equation of a straight line:

$$y - y_1 = m(x - x_1)$$



Example: Convert $4x - 2y - 5 = 0$ to Slope-Intercept Form

We are heading for:

$$y = mx + b$$

Start with:	$4x - 2y - 5 = 0$
Move all except y to the right:	$-2y = -4x + 5$
Divide all by (−2):	$y = 2x - 5/2$

And we are done! (Note: **m** = 2 and **b** = −5/2)

The slope-intercept form of the equation of a straight line is $y = -\frac{2}{3}x + 2\frac{1}{3}$

What is the general form of the equation?

A 2x + 3y - 7 = 0

B 2x - 3y - 7 = 0

C 2x + 3y + 7 = 0

D 2x - 3y + 7 = 0

The point-slope form of the equation of a straight line is $y + 3 = -\frac{2}{7}(x - 5)$

What is the general form of the equation?

A 2x - 7y + 11 = 0

B 2x - 7y + 31 = 0

C 2x + 7y + 11 = 0

D 2x + 7y + 31 = 0

$y + 3 = -\frac{2}{7}(x - 5)$

Multiply all terms by 7:

$7(y + 3) = 7 \times -\frac{2}{7}(x - 5)$

$\Rightarrow 7(y + 3) = -2(x - 5)$

$\Rightarrow 7y + 21 = -2x + 10$

$\Rightarrow 2x + 7y + 11 = 0$

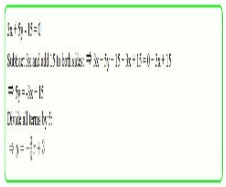
The General form of the equation of a straight line is 3x + 5y − 15 = 0.
What is the slope-intercept form of the equation?

A $y = -\frac{3}{5}x - 3$

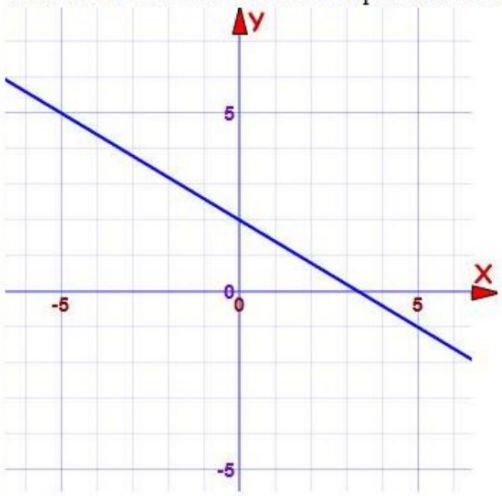
B $y = -\frac{3}{5}x + 3$

C $y = \frac{3}{5}x + 3$

D $y = \frac{3}{5}x - 3$



What is the General Form of the equation of a straight line for this graph?

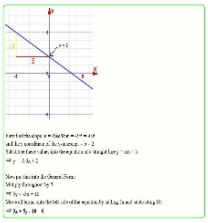


A $3x - 5y - 10 = 0$

B $3x + 5y - 10 = 0$

C $3y - 5x - 6 = 0$

D $3y + 5x - 6 = 0$



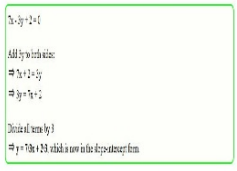
Convert 7x - 3y + 2 = 0 to Slope-Intercept Form

A y = -7/3x - 2/3

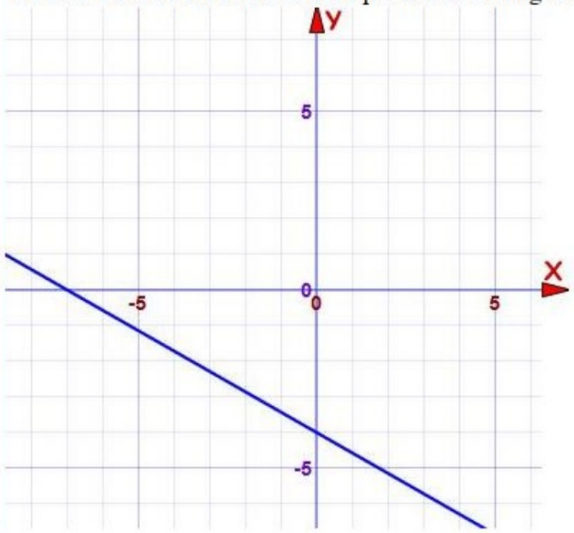
B y = -7/3x + 2/3

C y = 7/3x - 2/3

D y = 7/3x + 2/3



What is the General Form of the equation of a straight line for this graph?

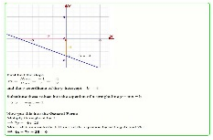


A $4x + 7y + 28 = 0$

B $4x + 7y - 28 = 0$

C $7x + 4y + 28 = 0$

D $7x + 4y - 28 = 0$



Convert 8x + 5y - 7 = 0 to Slope-Intercept Form.

A y = 1.6x + 1.4

B y = -1.6x + 1.4

C y = -1.6x - 1.4

D y = 1.6x - 1.4

$8x + 5y - 7 = 0$

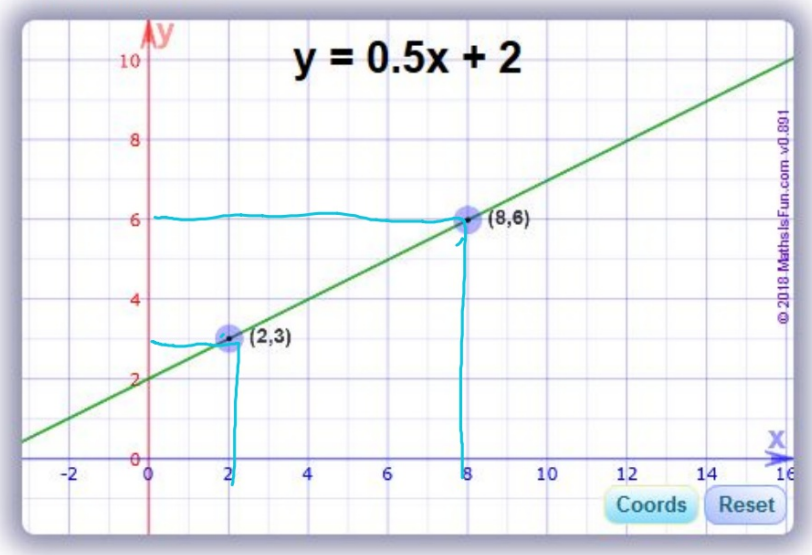
Subtract 8x and add 7 to both sides $\Rightarrow 5y = -8x + 7$

Divide all terms by $5 \Rightarrow y = -1.6x + 1.4$,

which is now in the slope-intercept form.

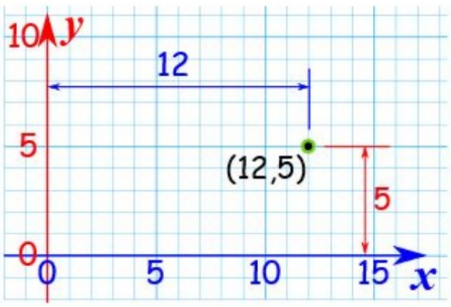
Equation of a Line from 2 Points

First, let's see it in action. Here are two points (you can drag them) and the equation of the line through them. Explanations follow.



The Points

We use Cartesian Coordinates to mark a point on a graph by **how far along** and **how far up** it is:



Example: The point **(12,5)** is 12 units along, and 5 units up

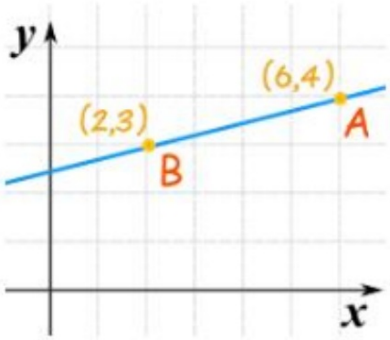
Steps

There are 3 steps to find the Equation of the Straight Line :

- 1. Find the slope of the line
- 2. Put the slope and one point into the "Point-Slope Formula"
- 3. Simplify

Step 1: Find the Slope (or Gradient) from 2 Points

What is the slope (or gradient) of this line?

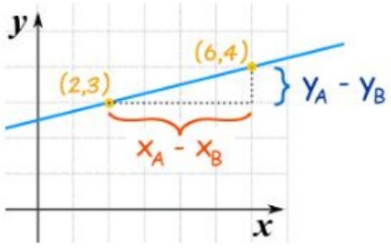


We know two points:

- point "A" is (6,4) (at x is 6, y is 4)
- point "B" is (2,3) (at x is 2, y is 3)

The slope is the **change in height** divided by the **change in horizontal distance**.

Looking at this diagram ...



$$\text{Slope } m = \frac{\text{change in y}}{\text{change in x}} = \frac{y_A - y_B}{x_A - x_B}$$

In other words, we:

- subtract the Y values,
- subtract the X values
- then divide

Like this:

$$m = \frac{\text{change in y}}{\text{change in x}} = \frac{4-3}{6-2} = \frac{1}{4} = 0.25$$

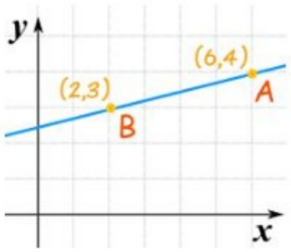
It doesn't matter which point comes first, it still works out the same. Try swapping the points:

$$m = \frac{\text{change in y}}{\text{change in x}} = \frac{3-4}{2-6} = \frac{-1}{-4} = 0.25$$

Same answer.

Step 2: The "Point-Slope Formula"

Now put that **slope** and **one point** into the "Point-Slope Formula"



Start with the "point-slope" formula ($\mathbf{x_1}$ and $\mathbf{y_1}$ are the coordinates of a point on the line):

$$y - y_1 = m(x - x_1)$$

We can choose **any point** on the line for $\mathbf{x_1}$ and $\mathbf{y_1}$, so let's just use point $(2,3)$:

$$y - 3 = m(x - 2)$$

We already calculated the slope "m":

$$\mathbf{m} = \frac{\text{change in y}}{\text{change in x}} = \frac{4-3}{6-2} = \frac{1}{4}$$

And we have:

$$y - 3 = \frac{1}{4}(x - 2)$$

That is an answer, but we can simplify it further.

Step 3: Simplify

Start with: $y - 3 = \frac{1}{4}(x - 2)$

Multiply $\frac{1}{4}$ and $(x-2)$: $y - 3 = \frac{x}{4} - \frac{2}{4}$

Add 3 to both sides: $y = \frac{x}{4} - \frac{2}{4} + 3$

Simplify: $y = \frac{x}{4} + \frac{5}{2}$

And we get:

$$y = \frac{x}{4} + \frac{5}{2}$$

Which is now in the Slope-Intercept ($\mathbf{y = mx + b}$) form.

Check It!

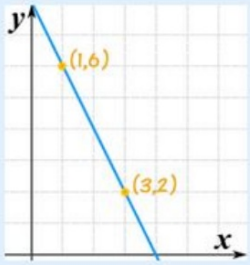
Let us confirm by testing with the second point $(6,4)$:

$$\mathbf{y} = \mathbf{x}/4 + 5/2 = \mathbf{6}/4 + 2.5 = 1.5 + 2.5 = \mathbf{4}$$

Yes, when x=6 then y=4, so it works!

Another Example

Example: What is the equation of this line?



Start with the "point-slope" formula :

$$y - y_1 = m(x - x_1)$$

Put in these values:

- $x_1 = 1$
- $y_1 = 6$
- $m = (2-6)/(3-1) = -4/2 = -2$

And we get:

$$y - 6 = -2(x - 1)$$

Simplify to Slope-Intercept ($\mathbf{y = mx + b}$) form:

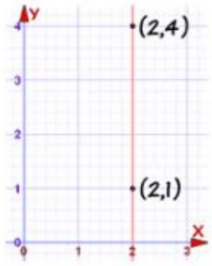
$$y - 6 = -2x + 2$$

$$y = -2x + 8$$

DONE!

The Big Exception

The previous method works nicely except for one particular case: a **vertical line**:



A vertical line's gradient is undefined (because we cannot divide by 0):

$$m = \frac{y_A - y_B}{x_A - x_B} = \frac{4 - 1}{2 - 2} = \frac{3}{0} = \text{undefined}$$

But there is still a way of writing the equation: use **x**= instead of **y**=, like this:

$$x = 2$$

What is the equation of the straight line that passes through the points (-2, 5) and (3, -5)?

A $y = -2x + 1$

B $y = -2x + 9$

C $y = 2x + 9$

D $y = 2x + 1$

What is the equation of the straight line that passes through the points (1, -1) and (8, 1)?

A $y = -\frac{2}{7}x - \frac{5}{7}$

B $y = -\frac{2}{7}x + \frac{9}{7}$

C $y = \frac{2}{7}x + \frac{5}{7}$

D $y = \frac{2}{7}x - \frac{9}{7}$

First find the slope using $m = \frac{y_2 - y_1}{x_2 - x_1}$ where $x_1 = 1, y_1 = -1, x_2 = 8$ and $y_2 = 1$

$m = \frac{1-(-1)}{8-1} = \frac{2}{7}$

Now use $y - y_1 = m(x - x_1)$ to find the equation of the line.

$y - (-1) = \frac{2}{7}(x - 1)$
$y + 1 = \frac{2}{7}x - \frac{2}{7}$
$y = \frac{2}{7}x - \frac{2}{7} - 1$
$y = \frac{2}{7}x - \frac{9}{7}$

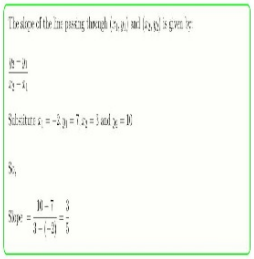
What is the slope of the straight line passing through the points (-2, 7) and (3, 10)?

A $\frac{1}{3}$

B $\frac{3}{5}$

C $\frac{5}{3}$

D 3



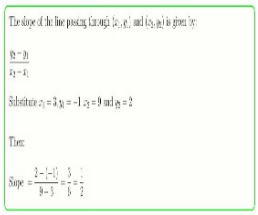
What is the slope of the straight line passing through the points (3, -1) and (9, 2)?

A $-\frac{1}{2}$

B $-\frac{1}{6}$

C $\frac{1}{6}$

D $\frac{1}{2}$



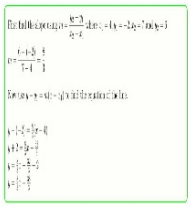
What is the equation of the straight line that passes through the points (4, -2) and (7, 6)?

A $y = \frac{8}{3}x - \frac{38}{3}$

B $y = \frac{8}{3}x - \frac{26}{3}$

C $y = -\frac{8}{3}x + \frac{38}{3}$

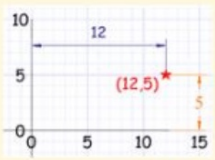
D $y = -\frac{8}{3}x + \frac{26}{3}$



Midpoint of a Line Segment

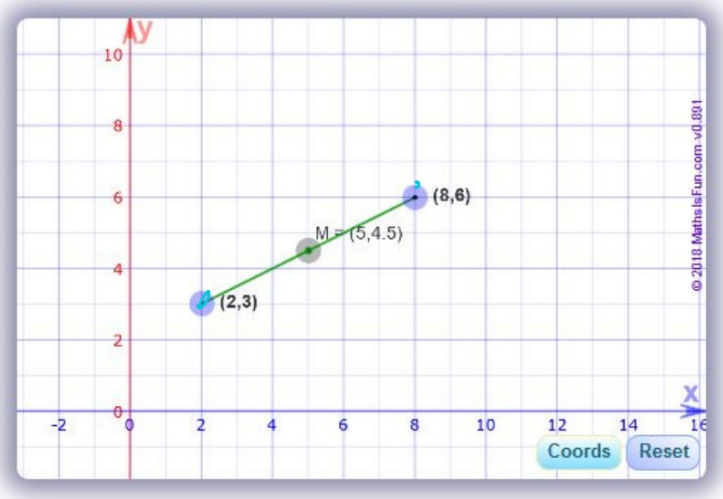
Coordinate Point

We can use Cartesian Coordinates to locate a point by **how far along** and **how far up** it is:



Here the point **(12,5)** is
12 units along, and 5 units up

And when we know **both end points** of a line segment we can find the **midpoint "M"** (try dragging the blue circles):



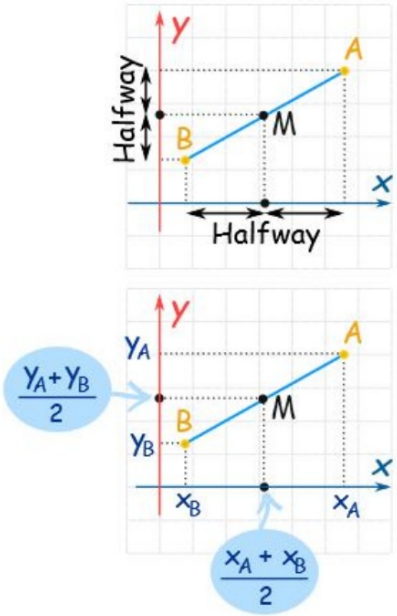
Midpoint of a Line Segment

The midpoint is **halfway** between the two end points:

- Its **x value** is halfway between the two x values
- Its **y value** is halfway between the two y values

To calculate it:

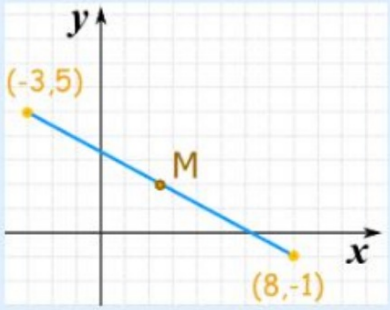
- Add both "x" coordinates, divide by 2
- Add both "y" coordinates, divide by 2



As a formula:

$$M = \left(\frac{x_A+x_B}{2} , \frac{y_A+y_B}{2} \right)$$

Example: What is the midpoint here?



Use the formula:

$$M = \left(\frac{x_A + x_B}{2} , \frac{y_A + y_B}{2} \right)$$

$$M = \left(\frac{(-3)+8}{2} , \frac{5+(-1)}{2} \right)$$

$$M = (5/2, 4/2)$$

$$M = (2.5, 2)$$

What is the midpoint of the straight line segment joining the points (-2, 5) and (6, -1)?

A (2, 2)

B (-4, 2)

C (2, 3)

D (-4, 3)

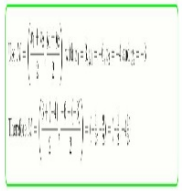
What is the midpoint of the straight line segment joining the points (3, -6) and (-4, -3)?

A $(3\frac{1}{2}, -4\frac{1}{2})$

B $(3\frac{1}{2}, -1\frac{1}{2})$

C $(-\frac{1}{2}, -1\frac{1}{2})$

D $(-\frac{1}{2}, -4\frac{1}{2})$



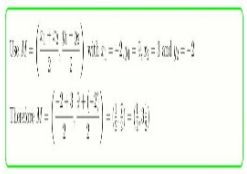
What is the midpoint of the straight line segment joining the points (-2, 9) and (3, -2)?

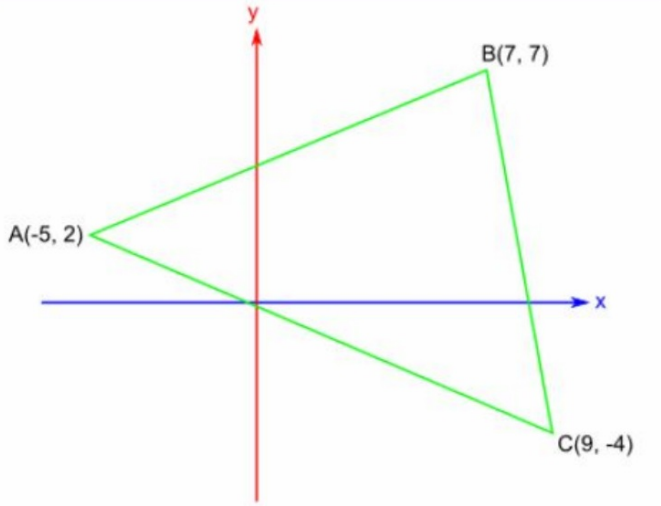
A $(\frac{1}{2}, 4\frac{1}{2})$

B $(-\frac{1}{2}, 3\frac{1}{2})$

C $(\frac{1}{2}, 3\frac{1}{2})$

D $(-\frac{1}{2}, 4\frac{1}{2})$





What is the midpoint of BC?

A $(8, 1\frac{1}{2})$

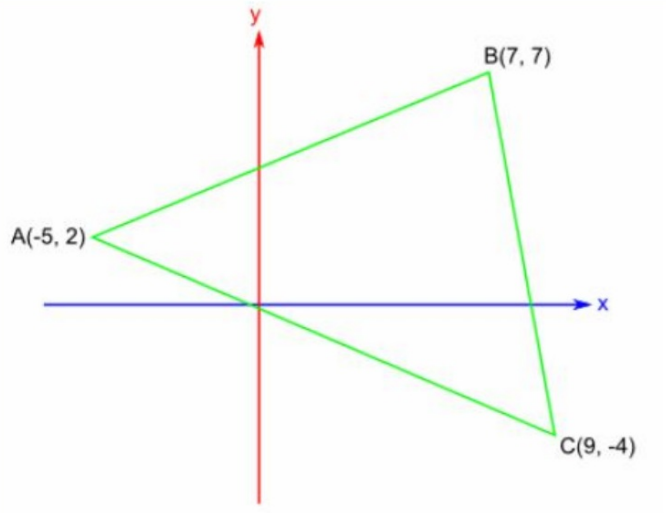
B $(-1, 1\frac{1}{2})$

C $(2, -1)$

D $(8, 5\frac{1}{2})$

$$\text{The midpoint} = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right) \text{ with } x_2 = 7, y_2 = 7, x_1 = 9 \text{ and } y_1 = -4$$

$$\text{The midpoint} = \left(\frac{7 + 9}{2}, \frac{7 + -4}{2}\right) = \left(\frac{16}{2}, \frac{3}{2}\right) = (8, 1\frac{1}{2})$$



What is the midpoint of CA?

A $(1, 4\frac{1}{2})$

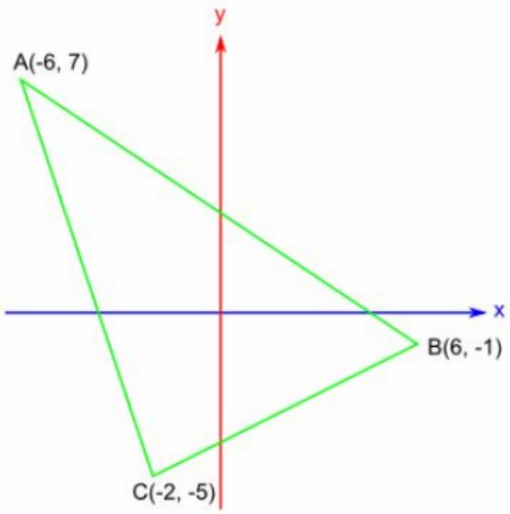
B $(7, -1)$

C $(2, -3)$

D $(2, -1)$

Use $M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ with $x_1 = 9, y_1 = -4, x_2 = -5$ and $y_2 = 2$.

Then $M = \left(\frac{9+(-5)}{2}, \frac{-4+2}{2}\right) = \left(\frac{4}{2}, \frac{-2}{2}\right) = (2, -1)$.



What is the midpoint of AC?

A $(-2, 1)$

B $(-4, 1)$

C $(-4, 6)$

D $(0, 3)$

NEXT TOPIC