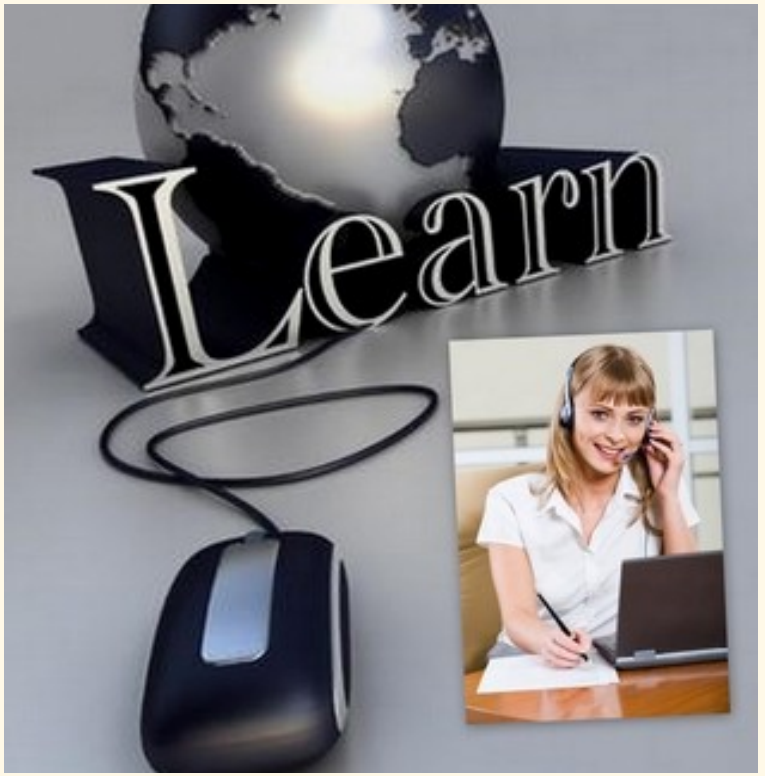
GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES



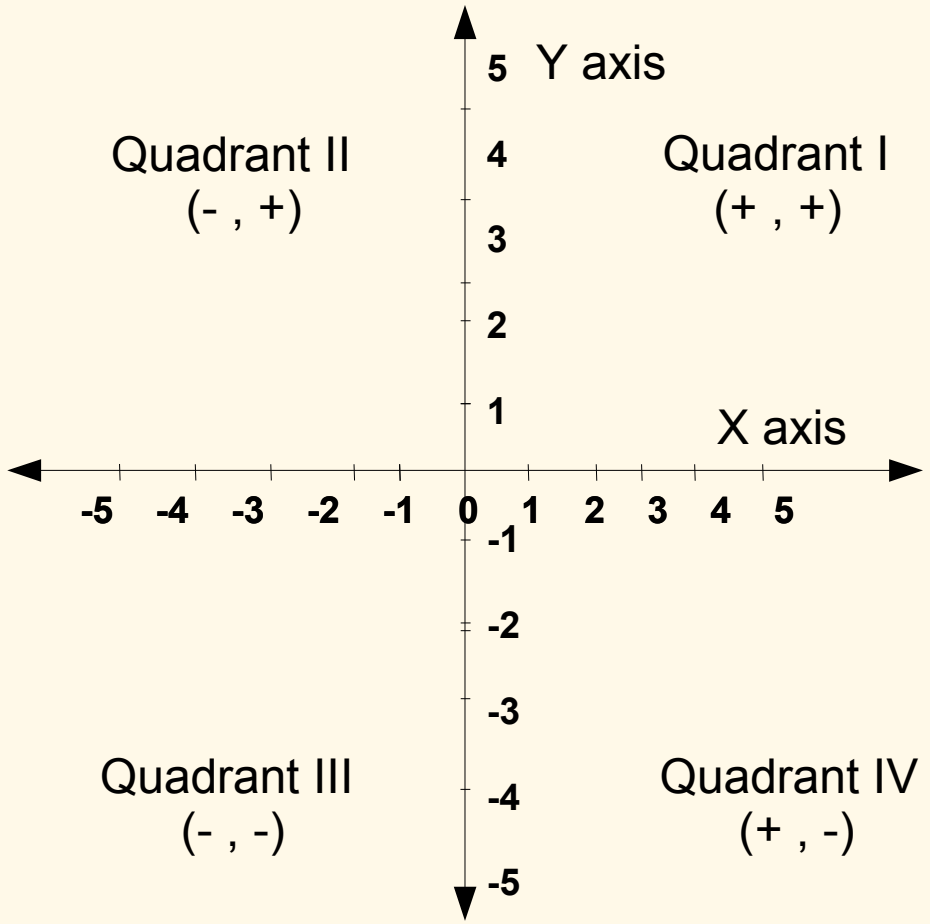
Coordinate Geometry I

Valued Epistemics Pvt Ltd;
No.124, 5th Street Padmanabha Nagar, Adyar, Chennai - 600 020. INDIA
Phone: +91 44 32428730 +91 9884453276
email: support@greedge.com

www.GREedge.com

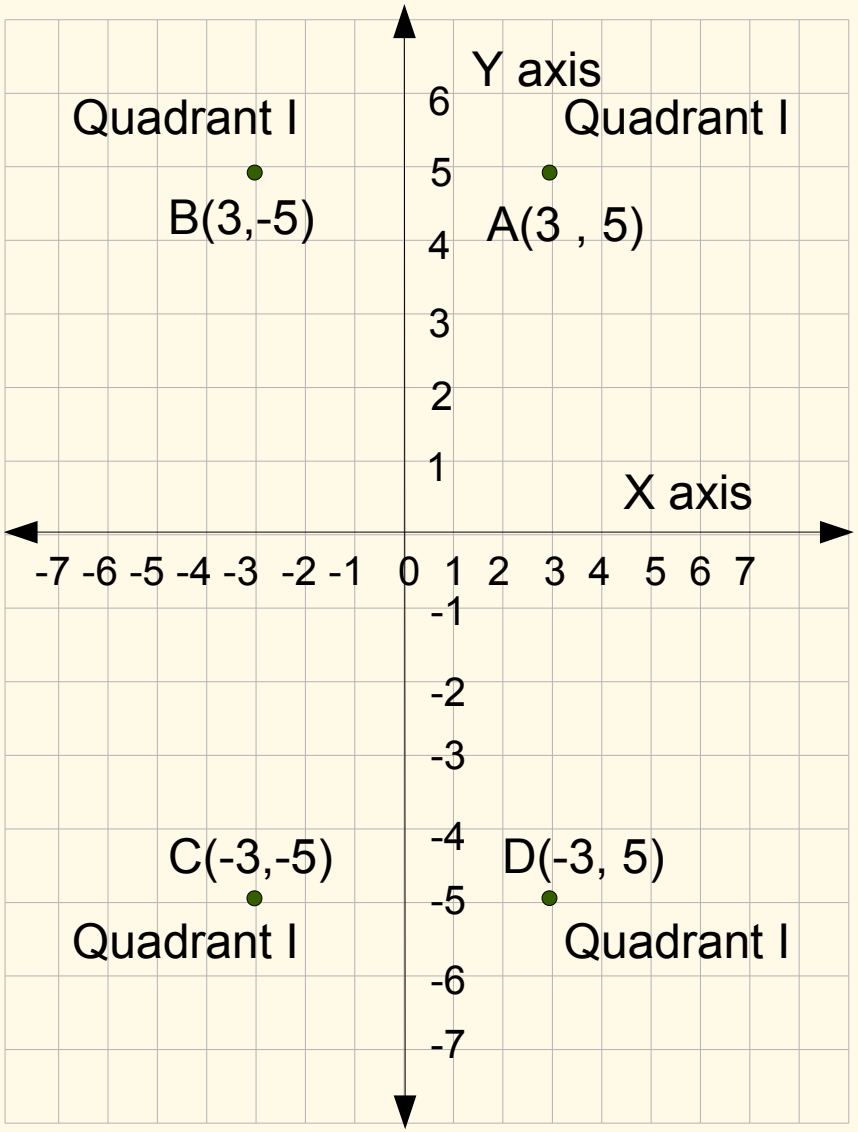
Basics In Coordinate geometry

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES



Introduction

A system of geometry where the position of points on the plane is described using a pair of numbers.



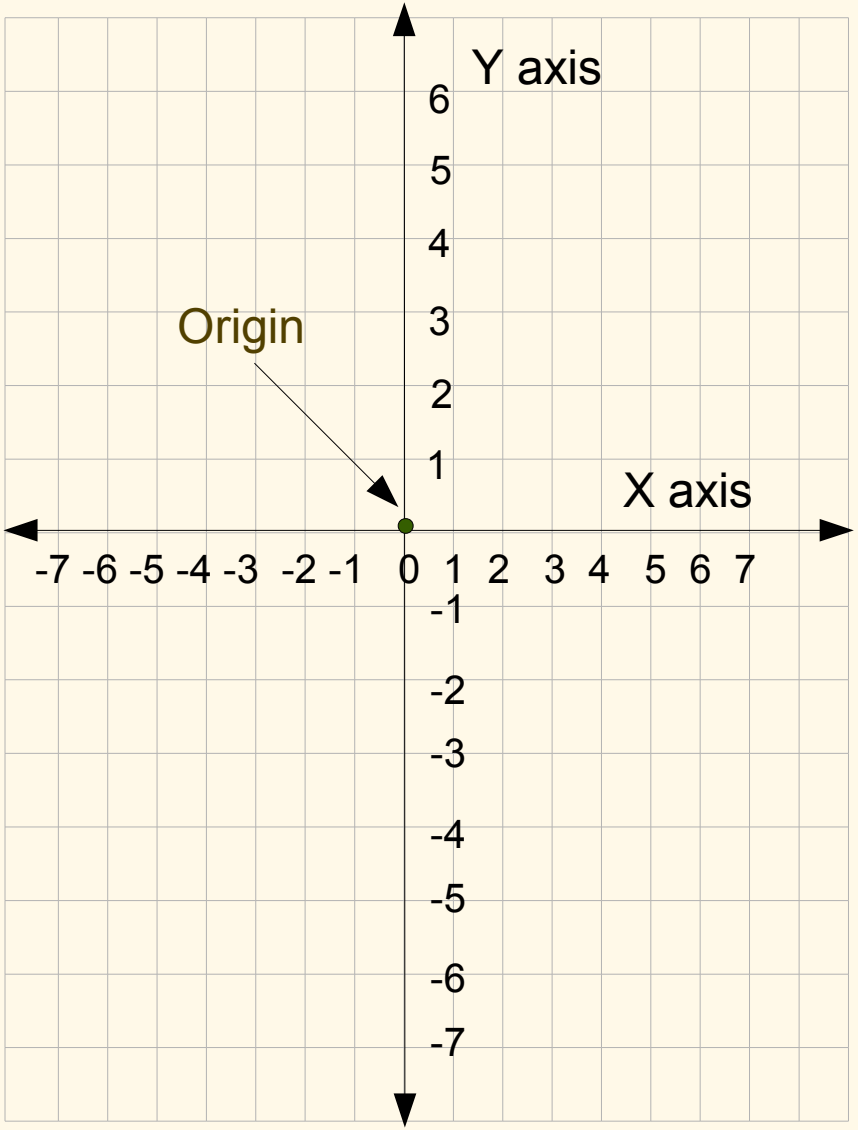
Origin

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

Definition :

In a graph origin is the point **(0,0)**.

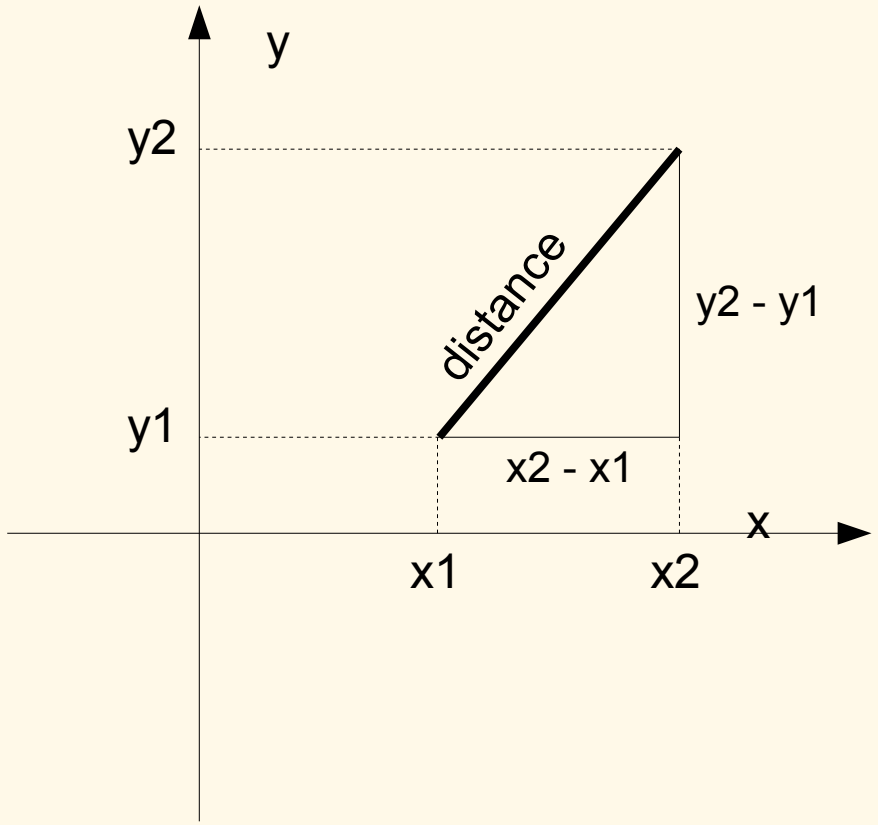
Where the x axis and y axis cross.



Distance between two points

Given the coordinates of two (x1,y1) and (x2,y2), the distance d between the points is given by

$$d = \sqrt{((x_2 - x_1)^2 + (y_2 - y_1)^2)}$$



Example

Find the distance between the points (-1, -2) and (-3, 5).

Can you find the answer?

Solution

Here, (x1, y1) = (-1, -2) and (x2, y2) = (-3, 5).

Therefore, x1 = -1, y1 = -2, x2 = -3, and y2 = 5.

Using the distance formula we get,

$$d = \sqrt{((x_2 - x_1)^2 + (y_2 - y_1)^2)} = \sqrt{((-3-(-1))^2 + (5-(-2))^2)}$$

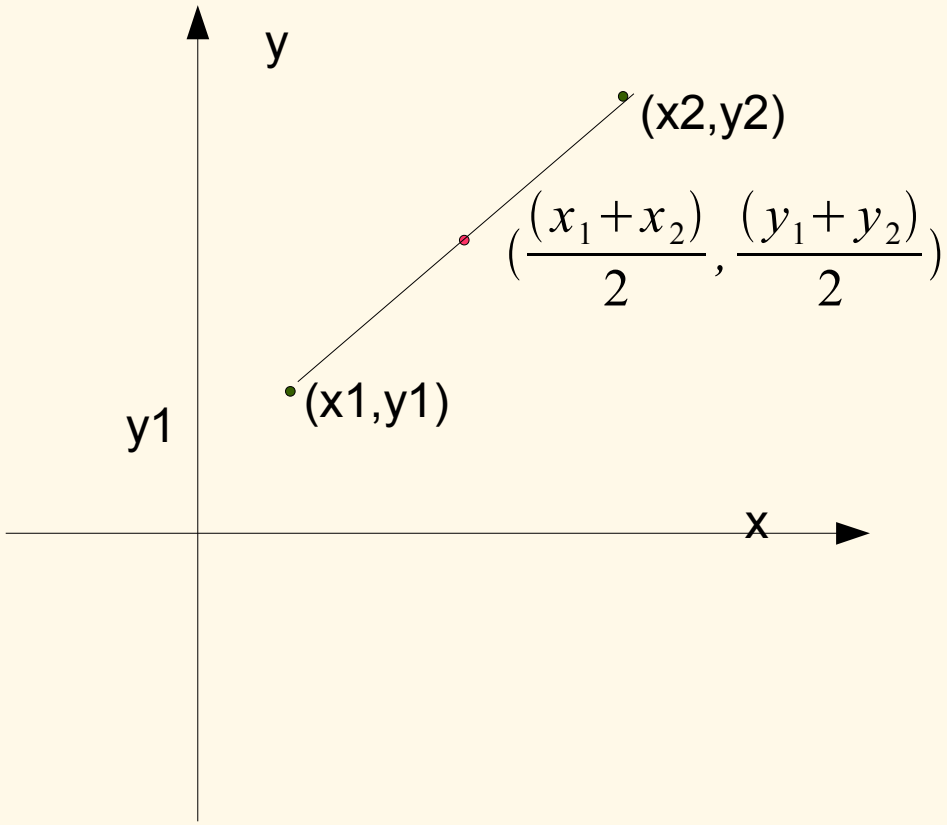
$$d = \sqrt{((-3+1)^2 + (5+2)^2)} = \sqrt{((-2)^2 + 7^2)}$$

$$d = \sqrt{(4+49)} = \sqrt{53}$$

Midpoint formula

The midpoint M of the line segment joining the points (x1, y1) and (x 2, y 2) is

$$\left(\frac{(x_1+x_2)}{2}, \frac{(y_1+y_2)}{2}\right)$$



Example

Given the points (-1, -2) and (-3, 5), find the midpoint of the line segment joining them.

Try this question.

Solution

Using the midpoint formula, label the points as x1 = -1, y1 = -2, x2 = -3, and y2 = 5.

$$M = \left(\frac{(x_1 + x_2)}{2}, \frac{(y_1 + y_2)}{2}\right)$$

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

$$M = \left(\frac{-4}{2}, \frac{3}{2}\right)$$

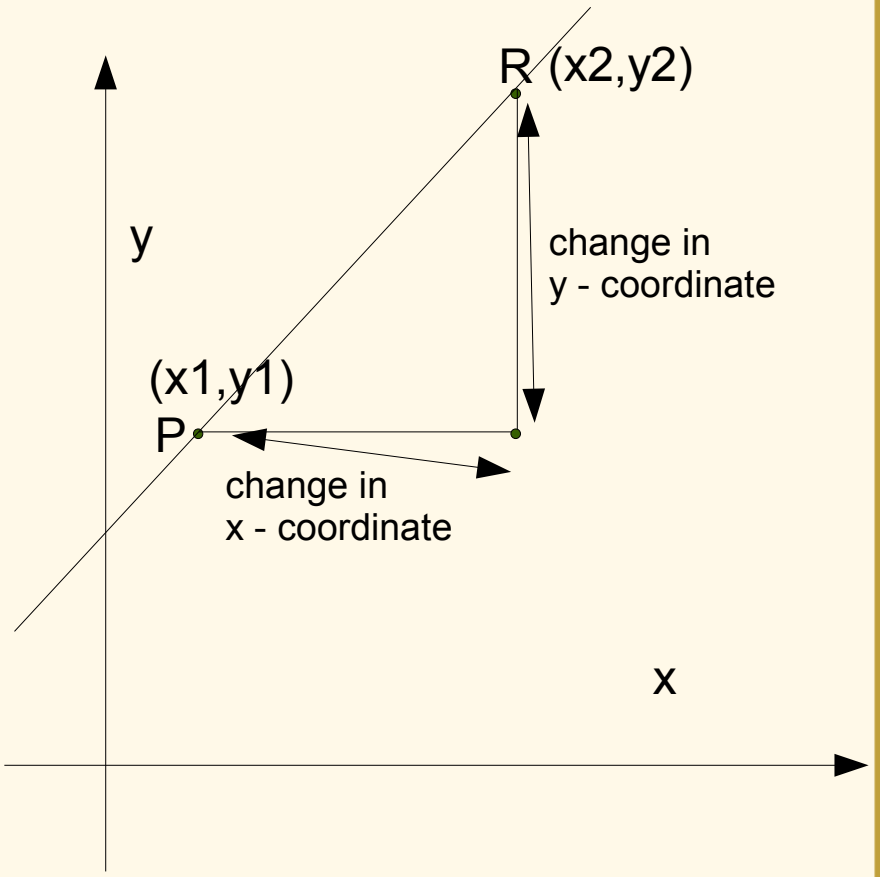
$$M = \left(-2, \frac{3}{2}\right)$$

Slope of a line

The **slope of a line** is a measurement of the steepness and direction of a non vertical line.

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

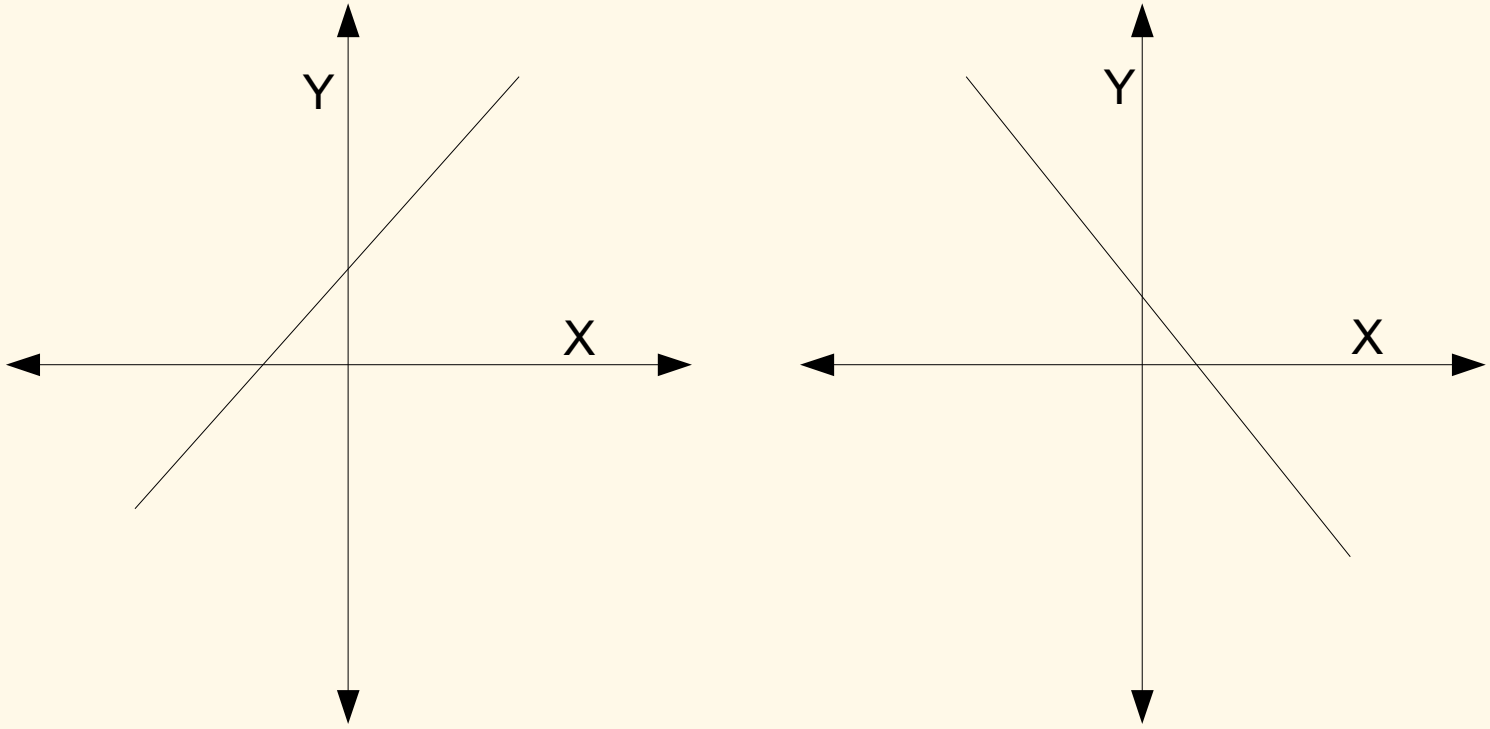
Note: The line which makes a larger angle with the X axis in the anti-clockwise direction has a greater slope.



Slope of a line

When a line rises from left to right, the slope is a positive number. Figure 1 (a) shows a line with a positive slope.

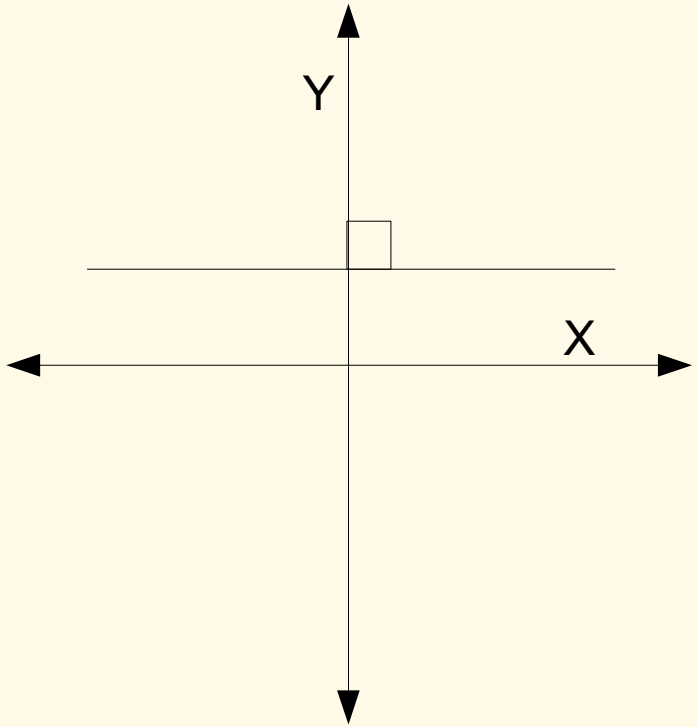
When a line falls from left to right, the slope is a negative number. Figure 1 (b) shows a line with a negative slope

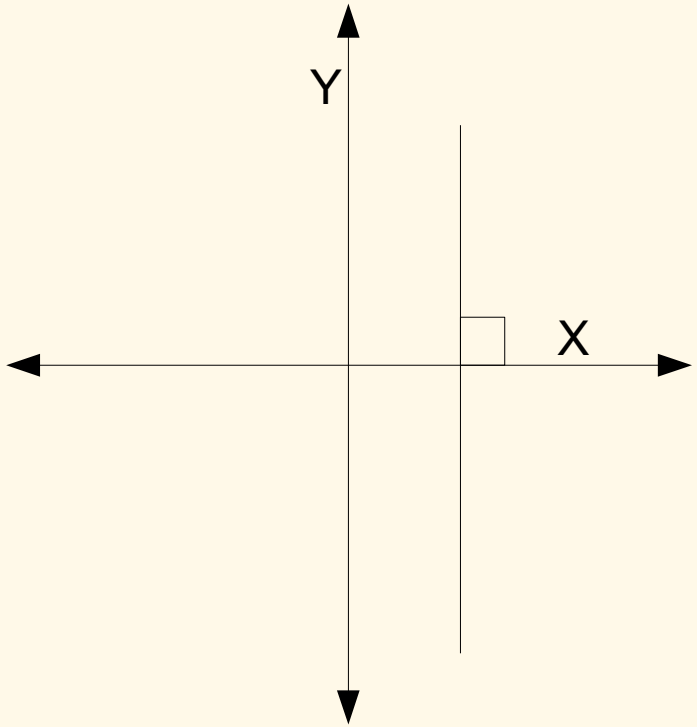


Slope of a line

The x-axis or any line parallel to the x-axis has a slope of zero. Figure 1 (c) shows a line whose slope is zero.

The y-axis or any line parallel to the y-axis has no slope. Figure 1 (d) shows a line with an no slope.



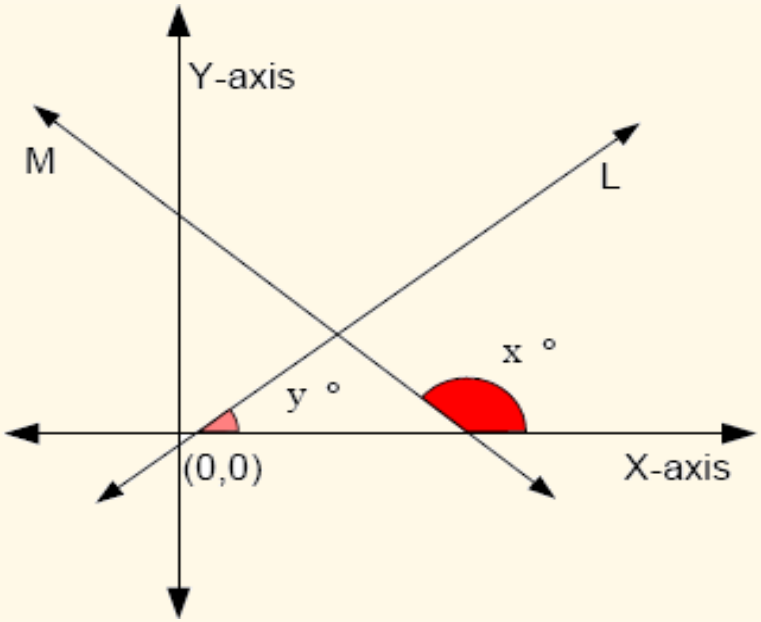


Properties of a Slope

If the angle made by the line with the X-axis lies in between 0° to 90°,then slope is positive.

Whereas if the angle made by the line with the X-axis lies in between 90° to 180°, then slope is negative.

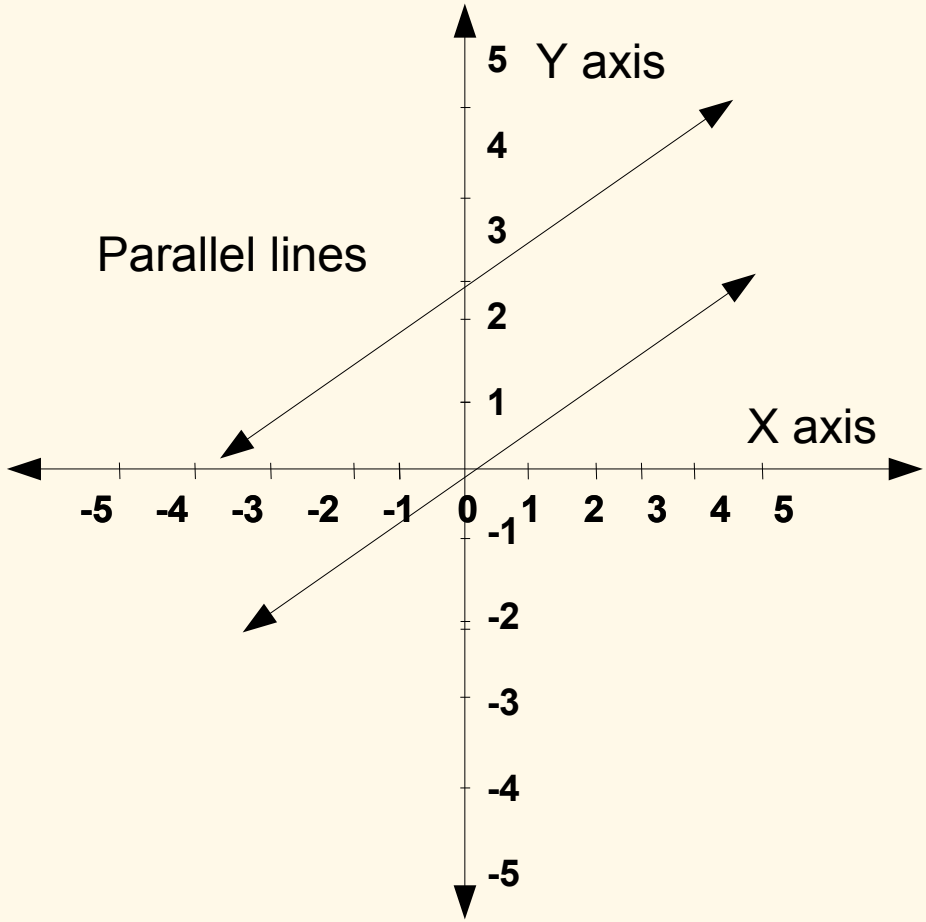
Hence in the above figure, slope of line L is positive (as 0° < y < 90°) and the slope of line M is negative (as 90° < x < 180°).



Parallel lines and their slopes

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

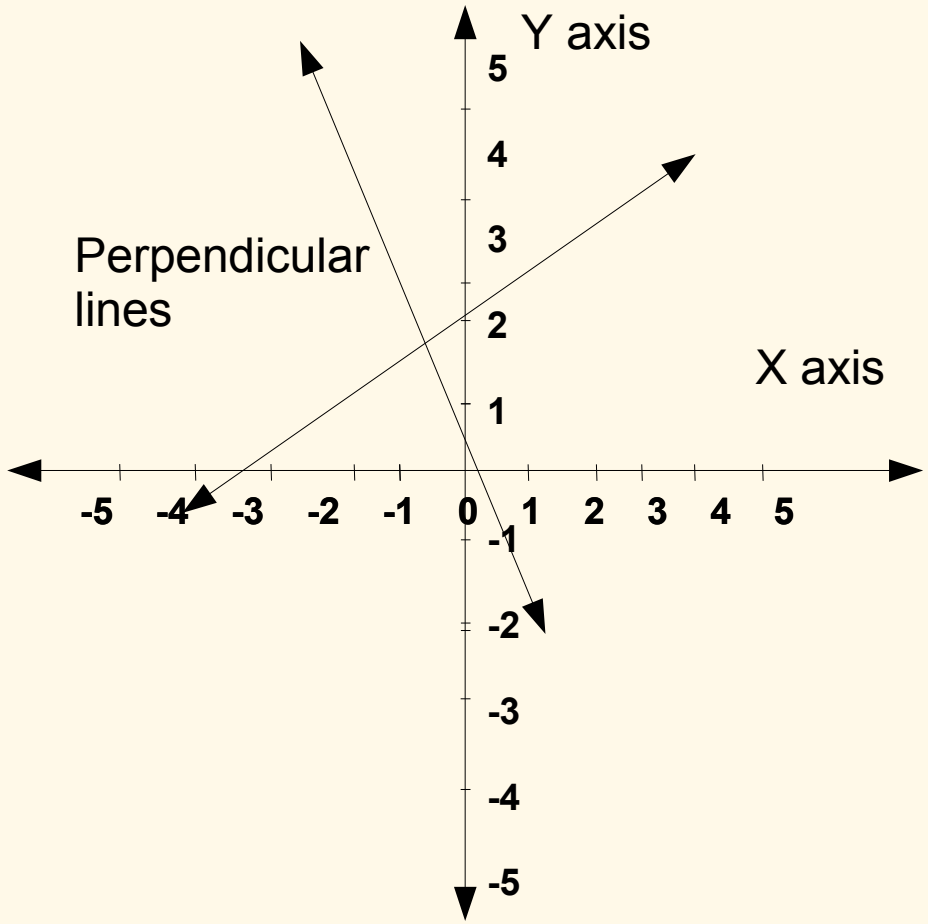
If two lines are parallel to each other then, their slopes are equal.



Perpendicular lines and their slopes

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

If two lines are perpendicular to each other then product of the slopes of those two lines is equal to -1.



Equation of a Straight Line

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

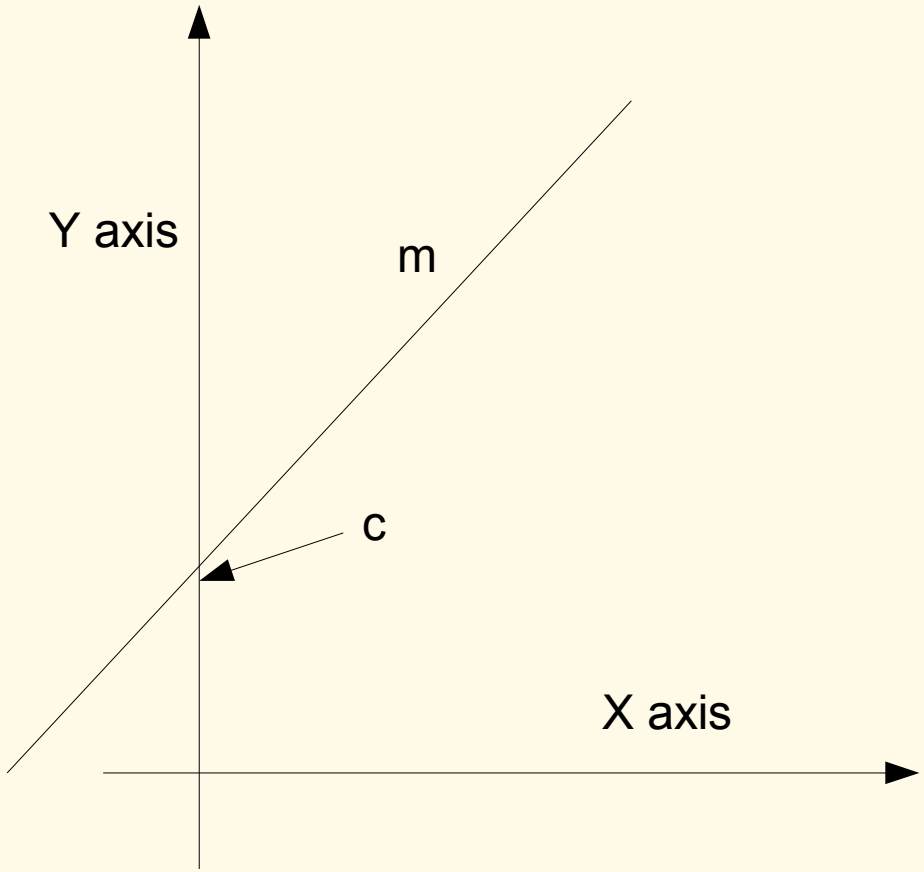
General Form of Equation of a Line

$$ax + by = c$$

Equation of a Straight Line

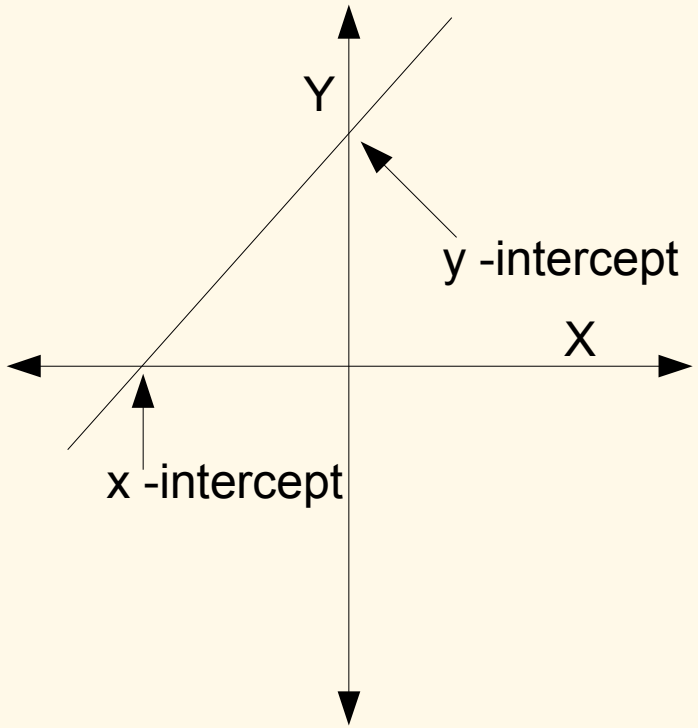
$$y = mx + c$$

slope y intercept



X and Y intercepts

Every line in the XY plane which is neither parallel to X axis nor to Y axis intersects the X axis and Y axis at some point.



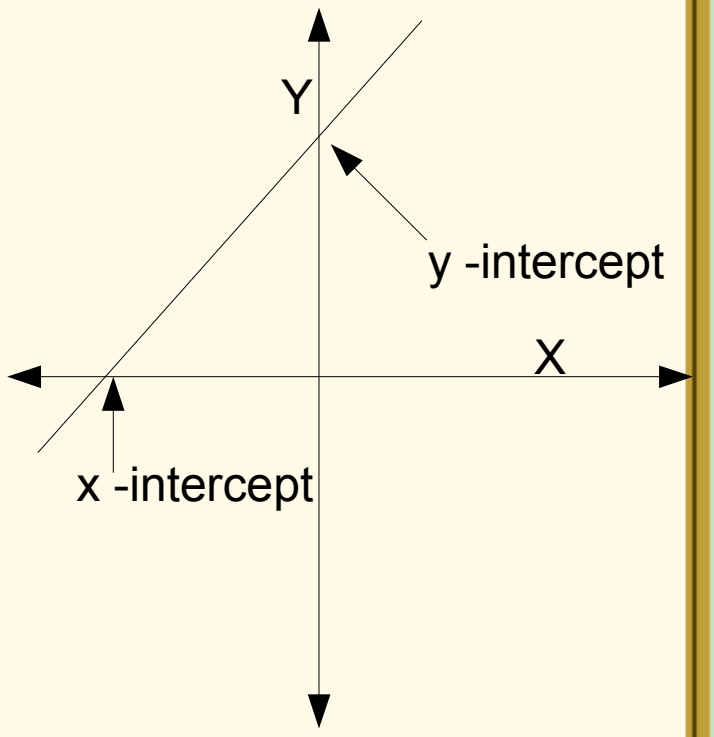
X and Y intercepts

The point at which line L intersects with X-axis is known as X-intercept of line L.

X intercept of a line = x-coordinate of the point where the line meets the X axis

The point at which line L intersects with Y axis is known as Y-intercept of line L.

Y intercept of a line = y co-ordinate of the point where the line meets the Y axis



Ways to Determine the Equation of a Straight Line

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

- Slope intercept form
- Point Slope Form
- Two-point form
- Intercept form

Slope Intercept Form

$$y = m x + c$$

Where,

m = Slope of the line
c = y- intercept

Example

Find the equation of the line that has a slope of 5 and a y-intercept of 2

Can you find the equation of the line?

Solution

Using the slope-intercept form,

$$y = mx + c$$

Where,
m = slope
c = y-intercept

Substituting the values m=5 and c=2

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

y = 5x +2 is the Equation of the line.

Point Slope Form

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

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

Where,
m = Slope of the line
P1 = (x1 , y1) is the point through which the line passes.

Example

Find the equation of the straight line that has slope $m = 4$ and passes through the point $(-1, -6)$.

Crack this question

Solution

Using Point slope form,

Here x1 = -1 and y1 = -6,
we get

$y- (-6) = 4(x- (-1))$

$y + 6 = 4(x+1)$

$y +6 = 4x +4$

$y = 4x – 2$ is the Equation of the line

Try this by Slope intercept form.

Using the slope-intercept form

$$y = mx + c$$

$(-6) = (4)(-1) + c$
$-6 = -4 + c$
$-2 = c$

Then the line equation must be **"$y = 4x - 2$" .**

Two point Form

$$y - y_1 = \left(\frac{(y_2 - y_1)}{(x_2 - x_1)}\right)(x - x_1)$$

Where,
(x1 , y1) and (x2,y2) are the points through which the line passes.

Example

Given that the line passes through the points (–2, 4) and (1, 2). Find the equation of the line.

Can you Solve this

Solution

Slope of the line is given by

$$y - y_1 = \left(\frac{(y_2 - y_1)}{(x_2 - x_1)}\right)(x - x_1)$$

Here the points given are, (x1,y1) = (–2, 4) and (x2,y2) = (1, 2).
Substituting we get,

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

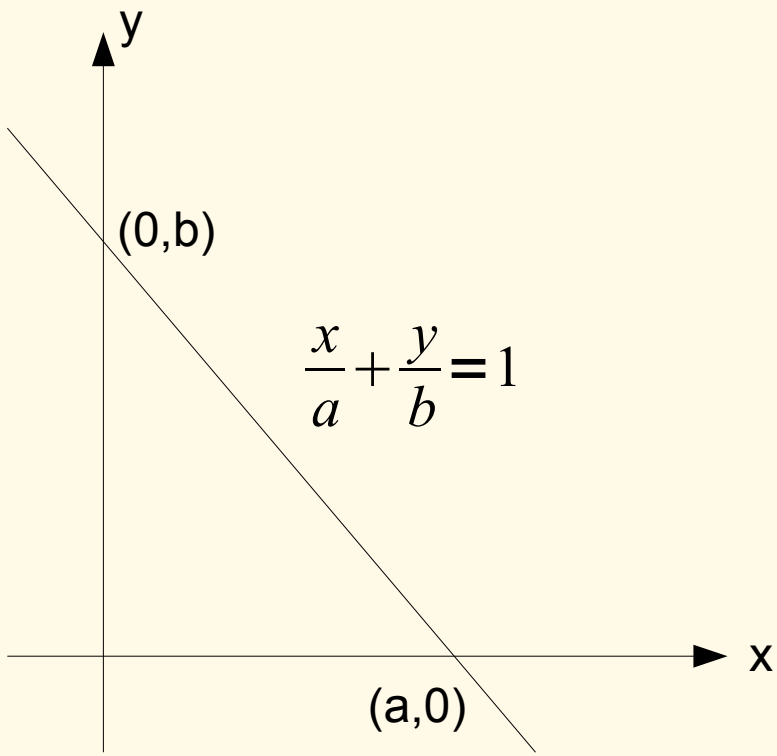
$$y - 4 = \frac{(-2)}{3}(x+2)$$

y - 4 = (-2x/3) – (2/3) * 2
y = (-2x/3) – 4/3 + 4
y = (-2/3)x – 8/3

Hence the equation of the line is, $y = (-2/3)x + 8/3$.

Intercept form

$$\frac{x}{a}+\frac{y}{b}=1$$



Where,
a = x- intercept
b = y- intercept

Note:
x-intercept is a point on the graph where y is zero
y-intercept is a point on the graph where x is zero.

Example

Find the x and y intercepts of the graph of the equations given below.

2x - y = 2

Try this

Solution:

Write the given equation of the line in form of Intercept form.

$$\frac{x}{a}+\frac{y}{b}=1$$

Given equation is 2x – y = 2

Dividing 2 in the above equation

2x/2 – y/2 = 2/2

x/1 – y/2 = 1

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

Here a = 1 and b = -2

Hence the x intercept is 1 and the y intercept is -2.

Slope of a line when X and Y intercepts are given

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

If X intercept of a line L is 'a' and Y intercept is 'b' then the slope of the line is given by (-b/a)

$$\frac{x}{a}+\frac{y}{b}=1$$

(bx + ay)/ab = 1
(bx + ay) = ab
ay = ab – bx
y = (-bx + ab)/a
y = -(b/a)x + b

Equation of the line is y = mx + b.
Where the slope, m = (-b/a)

Example

Find the slope of the line, if x intercept is 5 and y intercept is 8.

Solution:

Since X intercept and Y intercept are given.
The slope of line is given by = (-b/a) = (-8/5)

Hence the slope is (-8/5).

All in one

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

Two points A(3, -2) and B (6 , 4) are given. Answer the following questions.

(a) mid point of A and B
(b) distance between mid point of A&B and B
(c)slope of line AB
(d) equation of line AB
(e)x-intercept and y-intercept of line AB

GRE EDGE
YOUR ONLINE ACADEMY TO BOOST SCORES

Get GRE help, links, tips & questions on

http://twitter.com/GREedge

http://www.facebook.com/search/?q=greedge&init=quick#/group.php?gid=121441922244