

Different forms of the equation of a straight line

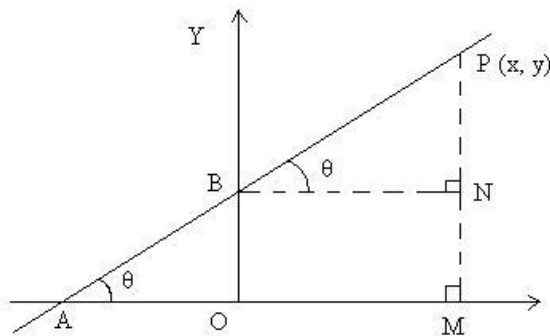
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The [equation of a straight line](#) can be written in different forms depending on the data given. The different forms are as follows:

- SLOPE INTERCEPT FORM OF A LINE
- POINT SLOPE FORM OF A LINE
- TWO POINT FORM OF A LINE
- THE INTERCEPT FORM OF A LINE
- NORMAL FORM OR PERPENDICULAR FORM OF A LINE
- DISTANCE FORM OF A LINE

Let's discuss a few of these in detail.

Slope Intercept Form of a Line



The equation of a line with [slope](#) m and making an [intercept](#) c on y – axis

is $y = mx + c$

Proof: Let the given line intersects y – axis at B and makes an angle θ with x – axis. Then $m = \tan \theta$. Let $P(x, y)$ be any point on the line. Draw PM perpendicular to x – axis and BN [perpendicular](#) to PM .

Clearly $\angle NBP = \theta$, $BN = OM = x$ and $PN = PM - NM = PM - OB = y - c$

From $\triangle PNB$, we have

$$\tan \theta = \frac{PN}{BN} = \frac{y - c}{x}$$

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

$y = mx + c$, which is the required equation of the line.

Important Remarks

1. If the line passes through the origin, then $0 = m \cdot 0 + c$; $c = 0$. Therefore, the equation of a line passing through the origin is $y = mx$, where m is the slope of the line.

2. If the line is parallel to x – axis, then $m = 0$, therefore the equation of a line parallel to x – axis is $y = c$.

Point – Slope Form of a Line

The equation of a line which passes through the point (x_1, y_1) and has the slope m is

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

Proof: Let Q (x₁, y₁) be the point through which the line passes and let P (x, y) be any point on the line. Then, slope of the line is $\frac{y - y_1}{x - x_1}$

But, m is the slope of the line.

$$\text{So, } m = \frac{y - y_1}{x - x_1}$$

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

Hence, $y - y_1 = m(x - x_1)$ is the required equation of the line.

Two – Point Form of a line

The equation of a line passing through two points (x₁, y₁) and (x₂, y₂) is

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

Proof: Let m be the slope of the line passing through (x₁, y₁) and (x₂, y₂). Then,

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

So, the equation of the line is

$$y - y_1 = m (x - x_1) \text{ [Using point – slope form]}$$

Substituting the value of m, we obtain

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

This is the required equation of the line in two point form.

Now try it yourself! Should you still need any help, [click here](#) to schedule live online session with e Tutor!

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Reference Links :

- http://en.wikipedia.org/wiki/Linear_equation#General_form
- <http://en.wikipedia.org/wiki/Slope>
- <http://en.wikipedia.org/wiki/Intercept>
- <http://en.wikipedia.org/wiki/Perpendicular>

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