$y=-5$

This is a horizontal line, so its slope is 0.

1-7-Slope of Perpendicular Lines

A set of perpendicular lines always has 90° angle between them. Let us suppose we have two perpendicular lines l_1 and l_2 in the coordinate plane, inclined at angle θ_1 and θ_2 respectively with the x-axis, such that the given angles follow the external angle theorem as, $\theta_2 = \theta_1 + 90°$.

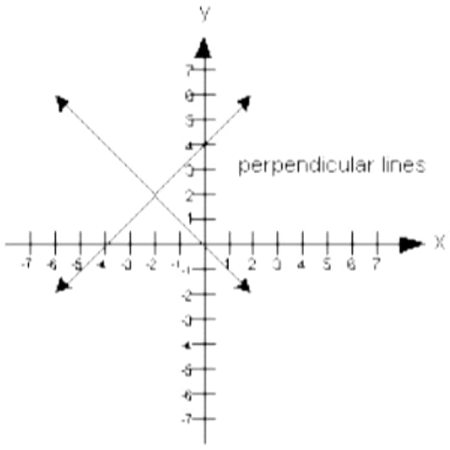
Therefore, their slopes can be given as,

$m_1 = \tan \theta_1$

$m_2 = \tan (\theta_1 + 90°) = - \cot \theta_1$

$\Rightarrow m_1 \times m_2 = -1$

Thus, the product of slopes of two perpendicular lines is equal to -1.



Example:

Find an equation for the line passes through the point (4,6),and Perpendicular to the line $4x+3y=12$

Answer:

$x=3$, $Y=4$

$4x+3y=12$

$3y=-4x+12$

$Y=-4/3\ x+4$

$m_1 = -4/3$

$m_2 = 3/4$

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

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

$y- 3/4\ x+3=0$

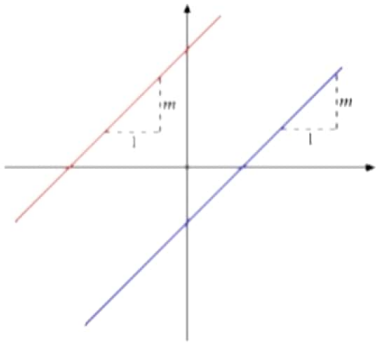
1-8- Slope of parallel lines

A set of parallel lines always have an equal angle of inclination. Let us suppose we have two parallel lines l_1 and l_2 in the coordinate plane, inclined at angle θ_1 and θ_2 respectively with the x-axis, such that the, $\theta_2 = \theta_1$.

Therefore, their slopes can be given as,

$$\Rightarrow m_1 = m_2$$

Thus, the slopes of the two parallel lines are equal.



Example:

Find an equation for the line passes through the point (-2,2),and Parallel to the line $2x+y = 4$

Answer:

$2x+y = 4$

$X=2 \quad , y= 4$

$m_1 = m_2$

$y= -2x+4$

$m_1=-2 \quad , \quad m_2 = -2$

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

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

$y + 2x + 2 = 0$

2- Formula for Distance Between Two Points:

The formula for the distance, dd, between two points whose coordinates are (x1,y1) and (x2,y2) is:

$$d = \sqrt{[(x2 - x1)^2 + (y2 - y1)^2]}$$

This is called the Distance Formula.

Example:

Find the distance between the two points with coordinates given as, A = (1, 2) and B = (1, 5).

Solution:

The distance between two points using coordinates can be given as,

$$d = \sqrt{[(x2 - x1)^2 + (y2 - y1)^2]},$$

where (x1,y1) and (x2,y2) are the coordinates of the two points.

$$\Rightarrow d = \sqrt{[(1 - 1)^2 + (5 - 2)^2]}$$

$$\Rightarrow d = 3 \text{ units}$$

2-1- Finding the Distance Between a Point and Line Given the Point and the Equation of the Line

Step 1: Identify the point and the equation of the given line.

Step 2: Represent the line as ax+by+c=0 and the point as (x1,y1)

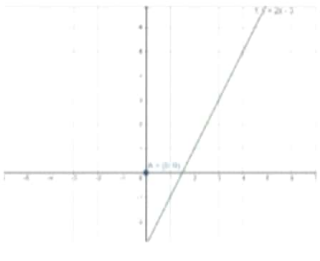
Step 3: Find the distance between the point and line using the formula

$$d=|ax_1+by_1+c| \quad /\sqrt{(a^2+b^2)}$$

where a, b, and c are real numbers. Both a and b

Example :

The line $y=2x-3$ is shown on the graph below. Determine the distance between the origin and the line.



Step 1: Identify the point and the equation of the given line.

Point: Origin A(0,0) , Line: $y=2x-3$

Step 2: Represent the line as $ax+by+c=0$ and the point as (x1,y1).
$-2x+y+3=0$

$a=-2$, $b=1$, $c=3$

Step 3: Find the distance between the point and line using the formula
$d=|ax_1+by_1+c|/\sqrt{(a^2+b^2)}$
, where a, b, and c are real numbers. Both a and b, cannot be zero.

$d=|-2\times0+1\times0+3|/\sqrt{(-2)^2+1^2}$

$d=|0+0+3|\ /\ \sqrt{4+1}$

$d=3\sqrt{5}=1.34$

The distance between the line and the origin is 1.34 units.

Example

Find the distance between the point $(-5,2)$ and $2y=-x-12$.

Step 1: Identify the point and the equation of the given line.

Point: $A(-5,2)$

Line:$2y=-x-1$

Step 2: Represent the line as $ax+by+c=0$ and the point as (x1,y1).

$x+2y+1=0$

$a=1$, $b=2$, $c=1$

Step 3: Find the distance between the point and line using the formula

$d=|ax_1+by_1+c|\ /\ \sqrt{(a^2+b^2)}$

Where a, b, and c are real numbers. Both a and b cannot be zero.

$d=|1\times-5+2\times2+1|\ /\ \sqrt{1^2+2^2}$

$d=|-5+4+1|\ /\ \sqrt{1+4}$

$d=0\ /\ \sqrt{5}=0$

The distance between the line and the point is 0 units