Linear coordinate geometry

Thursday, 3 January 2019 9:34 am

By the end of the lesson I would hope that you have an understanding of the concepts below which you can apply to a number of complex questions:

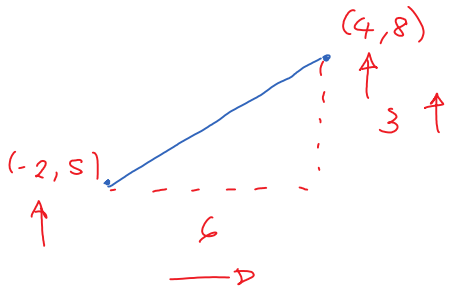
- How to find the distance between two points
- How to find the midpoint of a line segment
- How to find the gradient of a line
- How to find the equation of a line
- How to find equations which are parallel to lines
- How to find equations which are perpendicular to a line

RECAP

This chapter is a review of all the work which has been covered in Methods 1 and 2.
This section builds on the previous sections by showing how coordinate geometry is going to be important in later sections of this book.

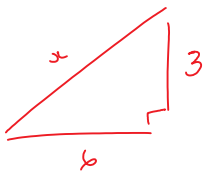
A good understanding of algebra is going to be key!

Coordinates and their geometry



Find the distance between two points

(-2,5) (4,8)



$c^2 = b^2 + c^2$

$x^2 = 3^2 + 6^2$

$x^2 = 9 + 36$

$x^2 = 45$

$x = \pm\sqrt{45}$

$x = \sqrt{45}$

$x = \sqrt{9 \times 5}$

$x = 3\sqrt{5}$

Find the midpoint of a line segment

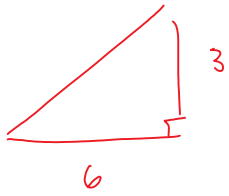
(-2,5) (4,8)

$\left(\frac{-2+4}{2}, \frac{5+8}{2}\right)$

$= \left(1, \frac{13}{2}\right)$

Find the gradient of a line

$(-2,5)$ $(4,8)$ gradient $= m = \frac{3}{6} = \frac{1}{2}$



Find the equation of a line

① m

(x_1, y_1) $(4,8)$

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

$y - 8 = \frac{1}{2}(x - 4)$

$y - 8 = \frac{1}{2}x - 2$

$y = \frac{1}{2}x - 2 + 8$

$y = \frac{1}{2}x + 6$

Find the equation of the line which is parallel to the line found above which passes through the point (4, 4)

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

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

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

$y = \frac{1}{2}x - 2 + 4$

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

Find the equation of the line which is perpendicular to the line found above and which passes through the midpoint of the two points given

$m_2 = \frac{-1}{m_1}$

$m_1 = \frac{1}{2}$

$M_2 = -\frac{2}{1}$

$m = -2$

$(1, 13/2)$

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

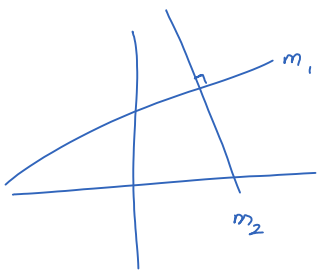
$y - \frac{13}{2} = -2(x - 1)$

$2y - 13 = -4(x - 1)$

$2y - 13 = -4x + 4$

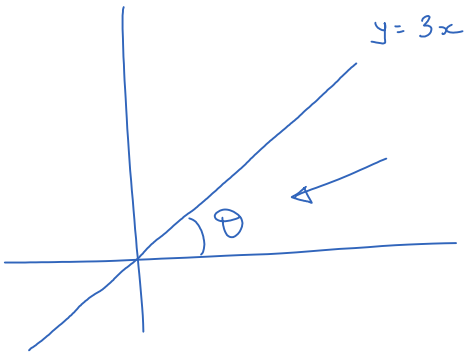
$2y = -4x + 17$

$m_1 m_2 = -1$

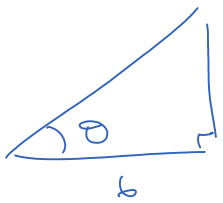


$y = -2x + \frac{17}{2}$

Tangent and gradient of the slope of a line



$m = 3$



$m = \frac{3}{6} = \frac{1}{2}$

$\tan\theta = \frac{3}{6} = \frac{\text{rise}}{\text{run}} = m$

$m = \tan\theta$

$\tan\theta = 3$

$\theta = \tan^{-1}(3)$