



Name: _____ () Class: _____ Date: _____

MA303.1.1 – Gradient-Point Form

At the end of this unit, you should be able to

- obtain equation of a straight-line using the gradient-point form

Prior to this unit you were already exposed to some concepts of coordinate geometry, such as midpoint, distance and gradient. You would also remember the gradient-intercept form of an equation of a straight line.

P1. Find the equation of the line joining the points $(4, -2)$ and $(-1, 5)$, expressing it in the form $ax + by = c$ where a , b and c are integers and are co-prime.

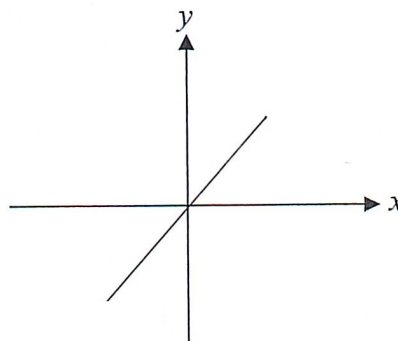
E1. A line l which is parallel to the y -axis passes through the intersection of the straight lines $y = 2x - 1$ and $x - 3y = 5$. Determine the equation of the line l .

Alternative form of equation of line

Previously we had studied the form of an equation of a line when the gradient and the y -intercept are both known. We now look at another form of the equation, when the coordinates of two points which lie on the line are given.

E2. Given two points $A(x_1, y_1)$ and $B(x_2, y_2)$.

- (a) Determine the gradient of the line passing through AB .



- (b) If C is a point on the line AB such that the coordinates of C is (x, y) , find the gradient of the line in terms of x and y , using the coordinates of A and C .

- (c) Is the gradient of AB the same as that of AC ? Hence or otherwise show that

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

(d) If the gradient of AB is denoted by m , show further that

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

Suppose A and B are two points on a line, such that their coordinates are (x_1, y_1) and (x_2, y_2) respectively. Then the equation of the line is given by

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

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

P2. Determine the equation of the line passing through

(a) $A(2, 5)$ and $B(-3, -2)$;

(b) $A(a, 0)$ and $B(2a, 3a)$.

E3. Find the equation of the line passing through $(3, 3)$ and parallel to another line passing through $(1, 3)$ and $(4, 12)$.

P3. The line $y = mx + c$ passes through the point $(1, -3)$ and is parallel to another line which passes through $(-2, 0)$ and $(3, -4)$. Find the values of m and c .

P4. Find the coordinates of the vertices formed by the following three lines.

$$y = 2x - 3, \quad y + 2x + 3 = 0, \quad x + 2y = 1$$

P5. Find the equation of the line parallel to the line $3x + 2y - 6 = 0$ and passing through the point where $x + y + 2 = 0$ intersects $3x - 2y + 1 = 0$. Interpret the question using a sketch, including the line required.