

13 Graphs

13.8A Equations of Parallel Lines

Parallel lines have the same gradient, so they will have the same value of m when their equations are written in the form $y = mx + c$.

For example, the lines $y = 2x + 6$ and $y = 2x - 7$ are parallel.



Worked Example 1

A line has equation $y = 4x - 1$. Another line is parallel to this and passes through the point with coordinates $(5, 2)$. Determine the equation of this line.



Solution

The given line $y = 4x - 1$ has gradient 4. The required line will therefore also have gradient 4, so its equation will be of the form

$$y = 4x + c$$

To determine the value of c , we know that when $x = 5$, $y = 2$, from the coordinates of the given point $(5, 2)$.

$$y = 4x + c$$

$$2 = 4 \times 5 + c$$

$$2 = 20 + c$$

$$c = -18$$

The equation of the parallel line is therefore $y = 4x - 18$.



Worked Example 2

A line has equation $y = -2x + 3$. A second line is parallel to this line. Determine the equation of this line if it passes through the point with coordinates $(-3, 4)$.



Solution

The gradient of the parallel line will also be -2 and so its equation will be of the form

$$y = -2x + c$$

At the point $(-3, 4)$, $x = -3$ and $y = 4$. These values can be used to determine the value of c .

$$y = -2x + c$$

$$4 = -2 \times (-3) + c$$

$$4 = 6 + c$$

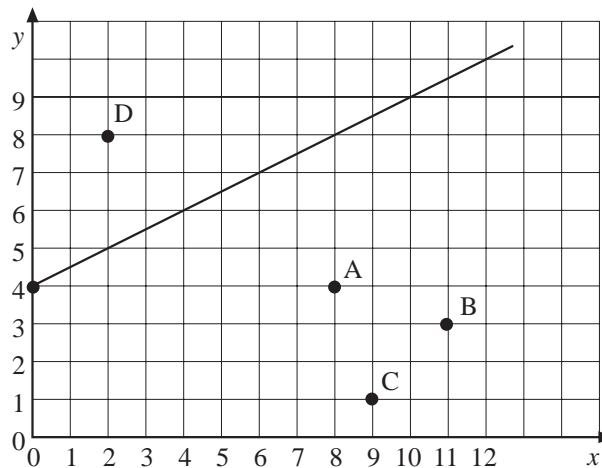
$$c = -2$$

The equation of the parallel line is therefore $y = -2x - 2$.



Exercises

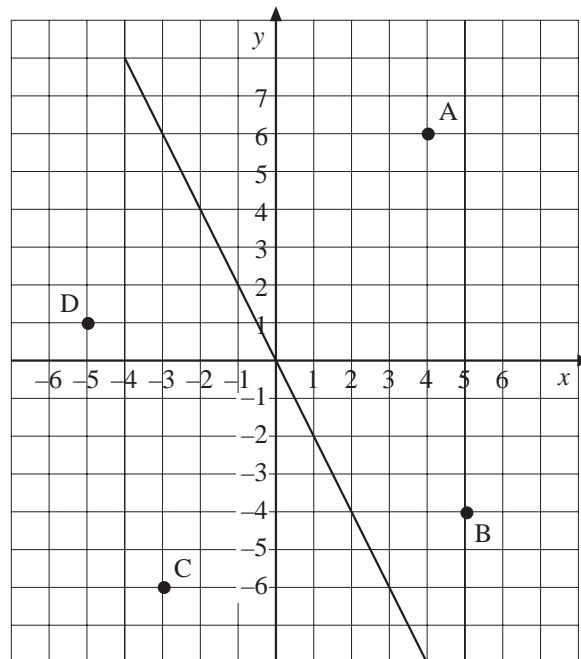
- Draw the line with equation $y = 2x + 1$.
 - Determine the equation of the line that is parallel to $y = 2x + 1$ and that passes through the point with coordinates $(4, 1)$.
 - Draw this line and confirm that it is parallel to $y = 2x + 1$.
- Determine the equation of the line that is parallel to $y = 3x - 1$ and passes through the point with coordinates $(0, 5)$.
- A line has equation $y = 4x - 1$. Determine the equations of parallel lines that pass through the points with coordinates
 - $(0, 8)$
 - $(7, 0)$
 - $(4, 5)$
- The line with equation $y = 10 - x$ is drawn. A parallel line passes through the point with coordinates $(2, 5)$. What is the equation of this line?
- The graph shows the line with equation $y = 4 + \frac{1}{2}x$.



Determine the equations of the parallel lines that pass through the points A, B, C and D.

- A line has equation $y = -3x + 8$. A parallel line passes through the point with coordinates $(-2, -4)$. Determine the equation of this line.
- A line passes through the point with coordinates $(4, 7)$ and $(8, 10)$. A parallel line passes through the point with coordinates $(4, 2)$. Determine the equations of both lines.

8. The diagram shows a line and the points A, B, C and D. Determine the equations of lines that are parallel to the line shown and that pass through each of the points.



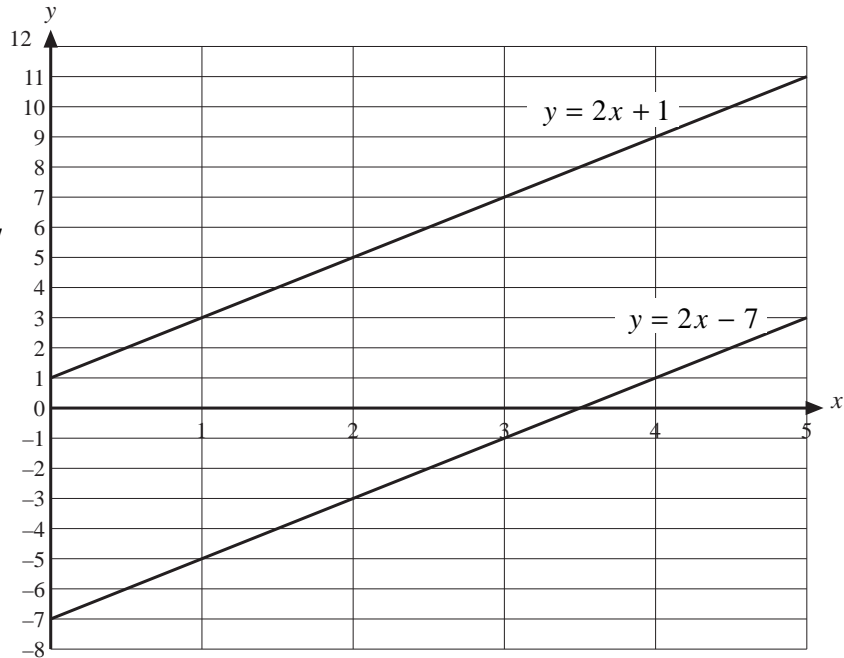
Answers

13.8A Equations of Parallel Lines

1. (a) and (c)

Diagram

(b) $y = 2x - 7$



2. $y = 3x + 5$

3. (a) $y = 4x + 8$ (b) $y = 4x - 28$ (c) $y = 4x - 11$

4. $y = 7 - x$

5. Equation of line through point A is $y = \frac{1}{2}x$ (or $2y = x$)

Equation of line through point B is $y = \frac{1}{2}x - 2\frac{1}{2}$ (or $2y = x - 5$)

Equation of line through point C is $y = \frac{1}{2}x - 3\frac{1}{2}$ (or $2y = x - 7$)

Equation of line through point D is $y = \frac{1}{2}x + 7$ (or $2y = x + 14$)

6. $y = -3x - 10$

7. $y = \frac{3}{4}x + 4$ $y = \frac{3}{4}x - 1$

8. Equation of line through point A is $y = -2x + 14$

Equation of line through point B is $y = -2x + 6$

Equation of line through point C is $y = -2x - 12$

Equation of line through point D is $y = -2x - 9$