

Linear Functions: The Features of Parallel and Perpendicular

1 The line L is parallel to the line $y = 3x + 1$ and passes through the point $A(2, 3)$. What is the equation of line L ?

A. $y = -3x + 3$

B. $y = 3x$

C. $y = 3x - 3$

D. $y = 3x + 2$

2 A linear function is parallel to the line $y = \frac{1}{2}x + 3$ and passes through the point $(-2, -4)$.

What is the equation of this function?

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

B. $y = \frac{1}{2}x - 3$

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

D. $y = \frac{1}{2}x + 3$

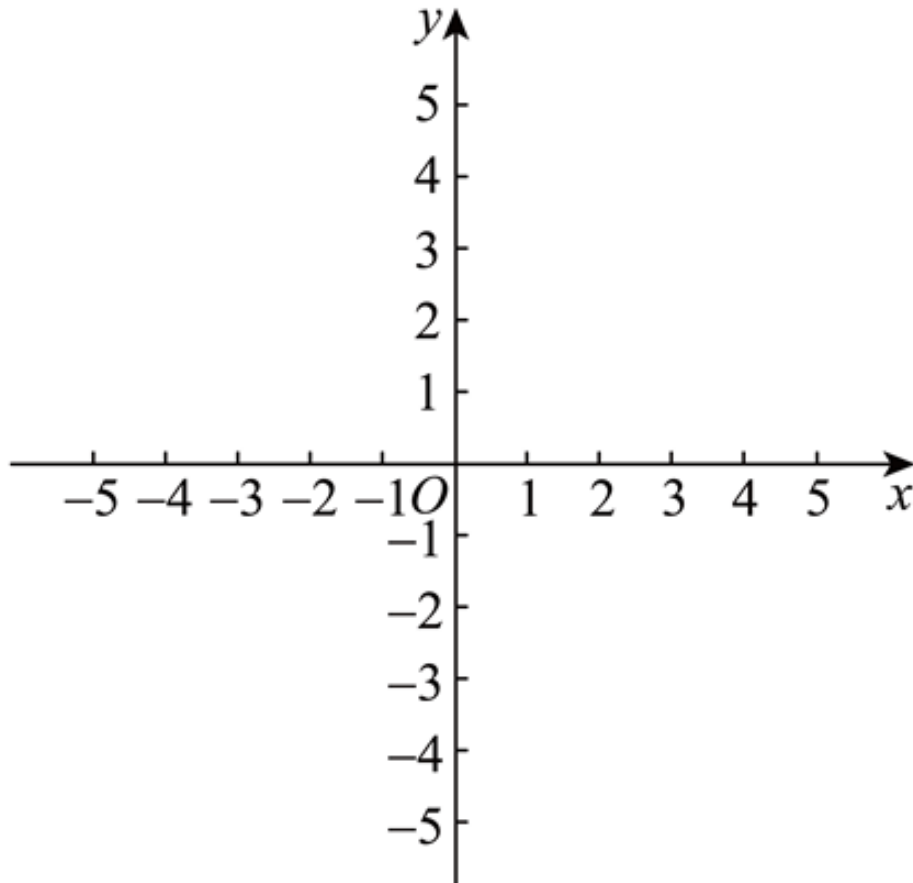
- 3 Given that the line y_2 is parallel to the line $y_1 = 2x - 1$ and passes through the point $(0, -5)$, what is the equation of y_2 ?

A. $y = 2x + 5$ B. $y = 2x - 5$ C. $y = 2x - 3$ D. $y = -2x - 3$

- 4 Given that the line l is parallel to the line $y = 2x$ and has a y -intercept of 5, the equation of line l is _____.

- 5 In the Cartesian coordinate plane, the graph of a linear function is parallel to the line $y = -\frac{1}{2}x$ and passes through the point $A(-2, 3)$. It intersects the x -axis at point B .

Find the equation of this linear function and sketch its graph.



- 6 A line l that passes through point $(4, 0)$ is perpendicular to line $y = -2x - 6$. The slope-intercept form of line l is _____.

7 The graph of a linear function is perpendicular to the line $y = x + 1$ and passes through the point $(2, 3)$. The equation of this linear function is _____.

8 The graph of the linear function $y = kx + b$ is perpendicular to the line $y = 2x + 1$ and passes through the point $P(-2, -1)$. The equation of this linear function is _____.

- 9 The equation of line l is given as $y = \frac{1}{2}x + 4$. Line l intersects the y -axis at point A . Line m passes through point A and is perpendicular to line l . The equation of line m is

_____.

- 10 Given that the line passing through points $A(-2, m)$ and $B(m, 4)$ is perpendicular to the line $2x + y - 1 = 0$, find the value of m .

A. 0 B. -8 C. 2 D. 10

Linear Functions: The Features of Parallel and Perpendicular

1 The line L is parallel to the line $y = 3x + 1$ and passes through the point $A(2, 3)$. What is the equation of line L ?

A. $y = -3x + 3$

B. $y = 3x$

C. $y = 3x - 3$

D. $y = 3x + 2$

Answer C

Solution Let the equation of line L be $y = kx + b$ where $k \neq 0$.

Since line L is parallel to the line $y = 3x + 1$, we have: $k = 3$

Since line L passes through the point $(2, 3)$, we substitute $x = 2$ and $y = 3$ into the equation:

$$3 = 3 \times (2) + b$$

Solving for b : $b = -3$

Thus, the equation of line L is: $y = 3x - 3$

The answer is C.

2 A linear function is parallel to the line $y = \frac{1}{2}x + 3$ and passes through the point $(-2, -4)$.

What is the equation of this function?

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

B. $y = \frac{1}{2}x - 3$

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

D. $y = \frac{1}{2}x + 3$

Answer B

Solution Given that the function is parallel to $y = \frac{1}{2}x + 3$, its equation can be written as:

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

Since the function passes through the point $(-2, -4)$, substituting $x = -2$ and $y = -4$ gives:

$$\frac{1}{2} \times (-2) + b = -4$$

Solving for b :

$$-1 + b = -4, b = -3$$

Thus, the equation of the function is:

$$y = \frac{1}{2}x - 3$$

The answer is **B**.

- 3 Given that the line y_2 is parallel to the line $y_1 = 2x - 1$ and passes through the point $(0, -5)$, what is the equation of y_2 ?

A. $y = 2x + 5$ B. $y = 2x - 5$ C. $y = 2x - 3$ D. $y = -2x - 3$

Answer **B**

Solution Let the equation of the function be $y = kx + b$.

$\therefore$ The line y_2 is parallel to the line $y_1 = 2x - 1$,

$\therefore k = 2$.

Substituting the point $(0, -5)$ into the equation: $-5 = 0 + b$

Solving for b : $b = -5$

$\therefore$ The equation of y_2 is: $y = 2x - 5$

Thus, the correct answer is: **B**.

- 4 Given that the line l is parallel to the line $y = 2x$ and has a y -intercept of 5, the equation of line l is _____.

Answer $y = 2x + 5$

Alternative: $y = 5 + 2x$

Solution Since line l is parallel to the line $y = 2x$, we assume its equation is of the form: $y = 2x + b$

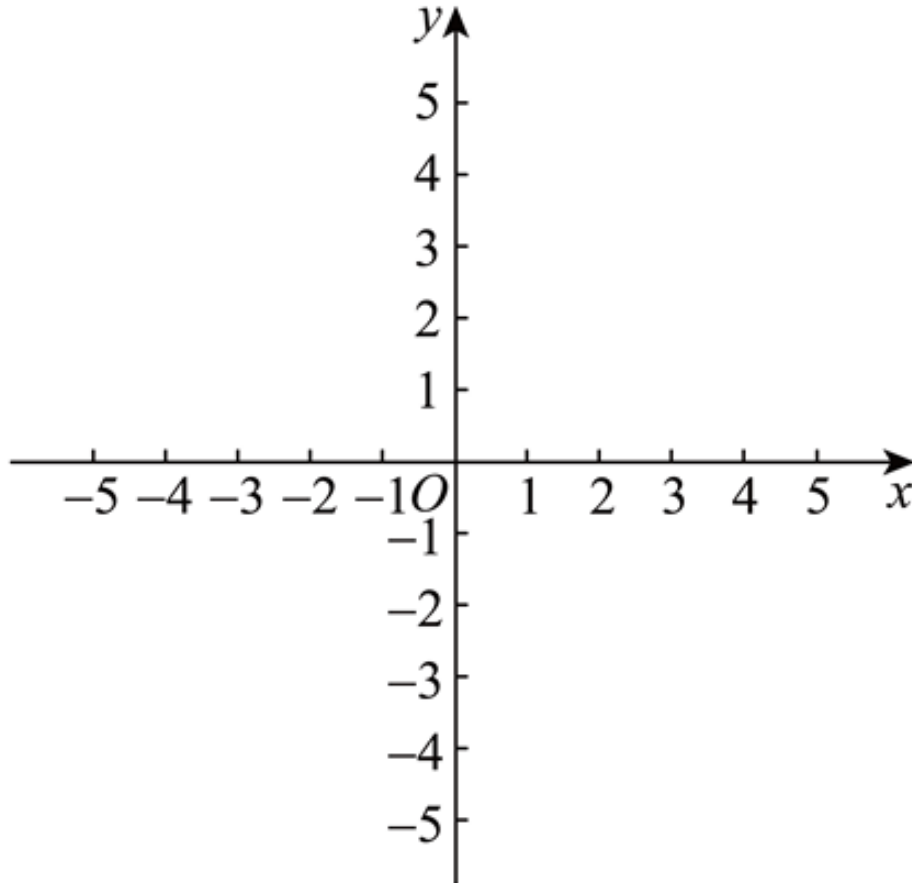
Given that the y -intercept is 5, we have: $b = 5$

Thus, the equation of line l is: $y = 2x + 5$

Therefore, the final answer is: $y = 2x + 5$

- 5 In the Cartesian coordinate plane, the graph of a linear function is parallel to the line $y = -\frac{1}{2}x$ and passes through the point $A(-2, 3)$. It intersects the x -axis at point B .

Find the equation of this linear function and sketch its graph.



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

Solution Let the equation of the linear function be: $y = kx + b$

Since the graph of the function is parallel to the line $y = -\frac{1}{2}x$ and passes through the point

$A(-2, 3)$, we have:
$$\begin{cases} k = -\frac{1}{2} \\ -2k + b = 3 \end{cases}$$

Solving for k and b :
$$\begin{cases} k = -\frac{1}{2} \\ b = 2 \end{cases}$$

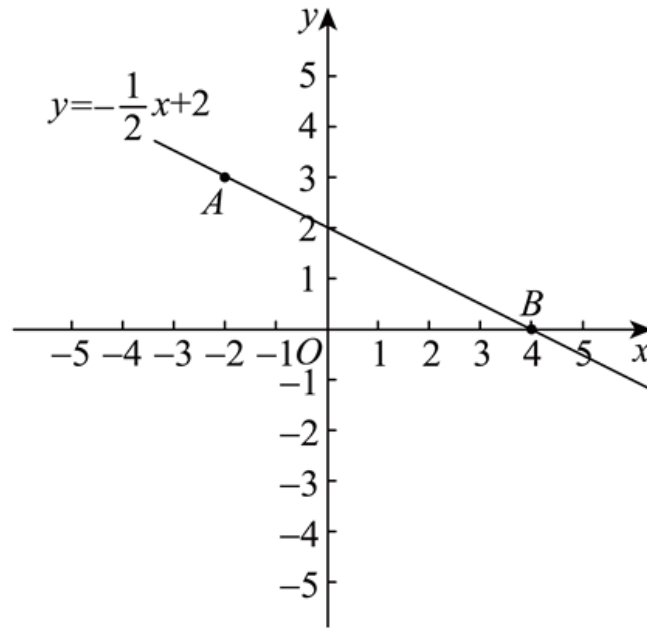
Thus, the equation of the linear function is: $y = -\frac{1}{2}x + 2$

To find the x -intercept, set $y = 0$: $0 = -\frac{1}{2}x + 2$

Solving for x : $x = 4$

Therefore, the graph of this function passes through point $A(-2, 3)$ and intersects the x -axis at point $B(4, 0)$.

The graph of the function is shown below.



- 6 A line l that passes through point $(4, 0)$ is perpendicular to line $y = -2x - 6$. The slope-intercept form of line l is _____.

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

Solution The slope of l is $\frac{1}{2}$, and the y -intercept is -2 .

- 7 The graph of a linear function is perpendicular to the line $y = x + 1$ and passes through the point $(2, 3)$. The equation of this linear function is _____.

Answer $y = -x + 5$

Solution $m = -1$

$$y - y_1 = m(x - x_1) \Rightarrow y - 3 = -1(x - 2)$$

$$y = -x + 5$$

The graph of the linear function $y = kx + b$ is perpendicular to the line $y = 2x + 1$ and passes through the point $P(-2, -1)$. The equation of this linear function is _____.

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

Alternative: $y = -2 - \frac{1}{2}x$

Solution Since the given linear function is perpendicular to the line $y = 2x + 1$, its slope must be the negative reciprocal of 2, which is $-\frac{1}{2}$.

Thus, we assume the equation of the function is: $y = -\frac{1}{2}x + b$

Since the function passes through the point $P(-2, -1)$, we substitute $x = -2$ and $y = -1$ into the equation: $-1 = -\frac{1}{2}(-2) + b$ $-1 = 1 + b$

Solving for b : $b = -2$

Thus, the equation of the function is: $y = -\frac{1}{2}x - 2$

9 The equation of line l is given as $y = \frac{1}{2}x + 4$. Line l intersects the y -axis at point A . Line m passes through point A and is perpendicular to line l . The equation of line m is _____.

Answer $y = -2x + 4$

Alternative: $y = 4 - 2x$

Solution The equation of line l is $y = \frac{1}{2}x + 4$, when $x = 0$, $y = 4$.

Therefore, the coordinates of point A are $(0, 4)$.

Since line m passes through point A and is perpendicular to line l , the slope of line m is the negative reciprocal of the slope of line l . The slope of line l is $\frac{1}{2}$, so the slope of line m is -2 .

Thus, we assume the equation of line m is $y = -2x + b$.

Substituting the point $(0, 4)$ into the equation, we get: $4 = b$

Therefore, the equation of line m is: $y = -2x + 4$

10 Given that the line passing through points $A(-2, m)$ and $B(m, 4)$ is perpendicular to the line $2x + y - 1 = 0$, find the value of m .

A. 0

B. -8

C. 2

D. 10

Answer C

Solution $k_{AB} = \frac{4 - m}{m + 2}$, $\frac{4 - m}{m + 2} \cdot (-2) = -1$,
 $\therefore m = 2$.