

Parallel & Perpendicular Lines

Parallel Lines	Perpendicular Lines
Parallel lines are lines that have the same slope magnitude and direction. These lines never touch or intersect. For parallel lines,  $m_1 = m_2$ The slope of Line 1 is equal to the slope of Line 2.	Perpendicular lines are lines that have the same slope magnitude but have different directions. These lines intersect to form a right angle. For perpendicular lines,  $m_1 \times m_2 = -1$ The product of the slopes for Lines 1 and 2 is -1.

Determining Parallel & Perpendicular Equations

EXAMPLE: Find the equation of the line parallel to $5y = 3x - 9$ which passes through the point $(-6, 5)$.

STEP ONE: Write the equation in slope-intercept form.

Convert the given equation to slope-intercept form ($y = mx + b$).

Let's call the given line, Line 1:

$$5y = 3x - 9 \rightarrow y = \left(\frac{3}{5}\right)x - \left(\frac{9}{5}\right) \quad \text{SLOPE-INTERCEPT FORM}$$

→ The slope gradient for Line 1 is $\left(\frac{3}{5}\right)$, so $m_1 = \left(\frac{3}{5}\right)$

→ Since $m_1 = m_2$ for parallel lines, $m_2 = \left(\frac{3}{5}\right)$.

STEP TWO: Find the y-intercept for Line 2.

Substitute m_2 and the point $(-6, 5)$ that Line 2 passes through into the slope-intercept equation to find the y-intercept.

$$y = mx + b \rightarrow (5) = \left(\frac{3}{5}\right)(-6) + b$$

$$\rightarrow b = \left(\frac{43}{5}\right)$$

STEP THREE: Write the equation for Line 2.

$$y = \left(\frac{3}{5}\right)x + \left(\frac{43}{5}\right) \text{ or } 5y = 3x + 43 \rightarrow \text{Parallel to Line 1}$$



Instructions: Answer the questions below.

1

Find the equation of the line passing through the point $(2, 0)$ that is perpendicular to the line $y - 3 = 5x$.

2

Find the equation of the line passing through the point $(1, -1)$ that is perpendicular to the line $y = -\frac{3}{4}x + 1$.

3

Find the equation of the line passing through the point $(2, -1)$ that is parallel to the line $3x + 2y = -12$.



4

Find the equation of the line passing through the point (6, 3) that is parallel to the line $4x - 5y = -10$.

5

Find the equation of the line passing through the point (2, -4) that is perpendicular to the line $6y = 15 - 8x$.

6

Find the equation of the line passing through the point (1, 3) that is parallel to the line $2x + y + 3 = 0$.



7

Find the equation of the line passing through the point (10, -5) that is parallel to the line $3x = 15 - y$.

8

Find the equation of the line passing through the point (5, -1) that is perpendicular to the line $\frac{5}{2}y = x + 3$.

9

Find the equation of the line passing through the point (6, 2) that is parallel to the line $24 = 7x - 8y$.

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Determining Parallel & Perpendicular Equations	
EXAMPLE: Find the equation of the line parallel to $5y = 3x - 9$ which passes through the point $(-6, 5)$. STEP ONE: Write the equation in slope-intercept form. Convert the given equation to slope-intercept form ($y = mx + b$). Let's call the given line, Line 1: $5y = 3x - 9 \rightarrow y = \left(\frac{3}{5}\right)x - \left(\frac{9}{5}\right) \quad \text{SLOPE-INTERCEPT FORM}$ $\rightarrow$ The slope gradient for Line 1 is $\left(\frac{3}{5}\right)$, so $m_1 = \left(\frac{3}{5}\right)$ $\rightarrow$ Since $m_1 = m_2$ for parallel lines, $m_2 = \left(\frac{3}{5}\right)$. STEP TWO: Find the y-intercept for Line 2. Substitute m_2 and the point $(-6, 5)$ that Line 2 passes through into the slope-intercept equation to find the y-intercept. $y = mx + b \rightarrow (5) = \left(\frac{3}{5}\right)(-6) + b$ $\rightarrow b = \left(\frac{43}{5}\right)$ STEP THREE: Write the equation for Line 2. $y = \left(\frac{3}{5}\right)x + \left(\frac{43}{5}\right) \text{ or } 5y = 3x + 43 \rightarrow \text{Parallel to Line 1}$	



Instructions: Answer the questions below.

1

Find the equation of the line passing through the point $(3, -3)$ that is perpendicular to the line $y = 2x - 4$.

2

Find the equation of the line passing through the point $(6, -1)$ that is perpendicular to the line $3x + 5y = 15$.

3

Find the equation of the line passing through the point $(4, 1)$ that is parallel to the line $7 = 3x + y$.



4

Find the equation of the line passing through the point $(5, 0)$ that is parallel to the line $y + x = 6$.

5

Find the equation of the line passing through the point $(-3, 1)$ that is perpendicular to the line $3y = x - 12$.

6

Find the equation of the line passing through the point $(4, -3)$ that is parallel to the line $y + 2x + 9 = 0$.



7

Find the equation of the line passing through the point (5, 3) that is parallel to the line $3 - 2x + 5y = 0$.

8

Find the equation of the line passing through the point (6, -7) that is perpendicular to the line $11 + 2x = y$.

9

Find the equation of the line passing through the point (4, 10) that is parallel to the line $y = -\frac{1}{2}x + 6$.