

Objectives: You will be able to identify parallel and perpendicular lines.



Recall:

Find the slope of the line that passes through (5, 8) and (-3, 1).

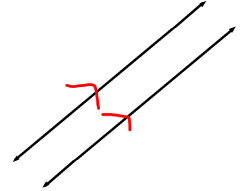
m = (1-8) / (-3-5) = -7 / -8 = 7/8

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Parallel Lines: Two lines that do not intersect.

→ Symbol: ||

→ How to mark lines parallel:

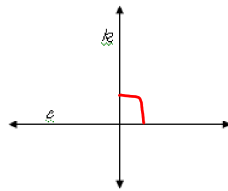


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Perpendicular Lines: Two lines that intersect at 90°.

→ Symbol: ⊥

→ How to mark lines perpendicular:



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Slopes of parallel lines are the same.

Slopes of perpendicular lines are opposite reciprocals.

m = 3 ⊥ m = -1/3
m = 1/4 ⊥ m = -4



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Horizontal and Vertical Lines

Two horizontal or two vertical lines are always parallel. m=0

A horizontal and a vertical line are always perpendicular.



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Example 1: Determine if the following lines are parallel, perpendicular or neither.

a. $y = 5x + 2$
 $y = 5x - 1$ \parallel

b. $y = -4x + 9$
 $y = 4x + 9$ neither

c. $y = 5 + \frac{1}{2}x$
 $y = -2x + 8$ \perp

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Example 2: Determine whether \overleftrightarrow{GH} and \overleftrightarrow{RS} are parallel, perpendicular or neither if $G(14, 12)$, $H(-7, 0)$, $R(-3, 7)$, and $S(-4, -5)$.

$m_{\overleftrightarrow{GH}} = \frac{0-12}{-7-14} = \frac{-12}{-21} = \frac{-4}{-7} = \frac{4}{7}$

$m_{\overleftrightarrow{RS}} = \frac{-5-7}{-4-(-3)} = \frac{-12}{-1} = 12$ neither

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Example 3: Determine whether \overleftrightarrow{PQ} and \overleftrightarrow{AB} are parallel, perpendicular or neither if $P(10, -3)$, $Q(11, 0)$, $A(-5, -6)$, and $B(-8, -5)$.

$m_{\overleftrightarrow{PQ}} = \frac{0-(-3)}{11-10} = \frac{3}{1} = 3$ \perp

$m_{\overleftrightarrow{AB}} = \frac{-5-(-6)}{-8-(-5)} = \frac{1}{-3} = -\frac{1}{3}$

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Example 4: Find the equation of the line parallel to $y = 3x + 10$ through the point $(3, 2)$

$y = mx + b$

$m = 3$
 $x = 3$
 $y = 2$

$2 = 3(3) + b$
 $2 = 9 + b$
 $-7 = b$

$y = 3x - 7$

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Example 5: Find the equation of the line perpendicular to $y = 3x + 10$ through the point $(3, 2)$

$\perp m = -\frac{1}{3}$

$y = mx + b$
 $2 = -\frac{1}{3}(3) + b$
 $2 = -1 + b$
 $3 = b$

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

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