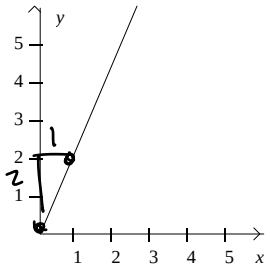
Chapter 3.3 Notes

Slope of Lines

- *Goal:*
- *You will find the slope and use it to identify parallel and perpendicular lines.*

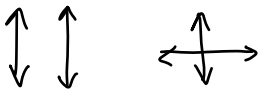
Slope

- Definition: rate of change
- Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$
- Another way to find: $\frac{\text{rise}}{\text{run}}$
- Example: $m = 2$



Postulates

- Two nonvertical lines have the same slope iff they are parallel.
- Two nonvertical lines are perpendicular iff their product of their slopes is -1.



$-\frac{3}{1} \cdot \frac{1}{3} = -\frac{3}{3} = -1$ opposite reciprocal

Examples:

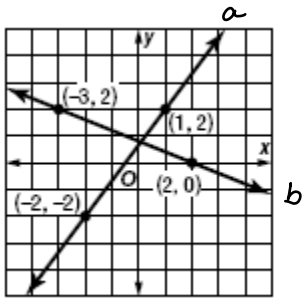
- If the slope of a line is -3, what is the slope of the line parallel to it? -3
- If the slope of a line is $\frac{2}{7}$, what is the slope of the line parallel to it? $\frac{2}{7}$
- If the slope of a line is $-\frac{3}{1}$, what is the slope of the line perpendicular to it? $\frac{1}{3}$
- If the slope of a line is $\frac{2}{7}$, what is the slope of the line perpendicular to it? $-\frac{7}{2}$

Example 1 **Find the slope of a line parallel to the line containing $A(-3, 4)$ and $B(2, 5)$.**

$x_1\ y_1$ $x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-4}{2+3} = \boxed{\frac{1}{5}}$

- Find the slope of each line in the picture to the right.



$\frac{4}{3}$ $-\frac{2}{5}$ $-\frac{2}{5} = \frac{-2}{5} = \frac{2}{-5}$

- **Determine whether $\overleftrightarrow{MN}$ and $\overleftrightarrow{RS}$ are *parallel*, *perpendicular*, or *neither*.**

1. $M(0, 3), N(2, 4), R(2, 1), S(8, 4)$

Slope $\overleftrightarrow{MN} = \frac{4-3}{2-0} = \frac{1}{2}$

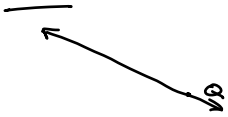
$\overleftrightarrow{RS} = \frac{4-1}{8-2} = \frac{3}{6} = \frac{1}{2}$

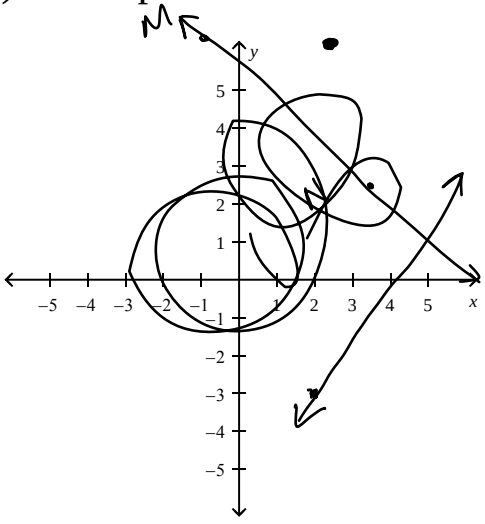
parallel

$\frac{1}{2}$ $-\frac{1}{2}$ → neither

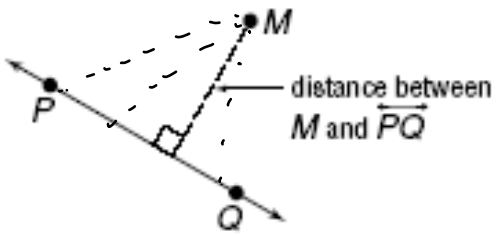
$\frac{1}{2}$ -2 → $\perp$

- Graph the line that contains Q(5,1) and is parallel to $\overleftrightarrow{MN}$ with M(-2,4) and N(2,1).

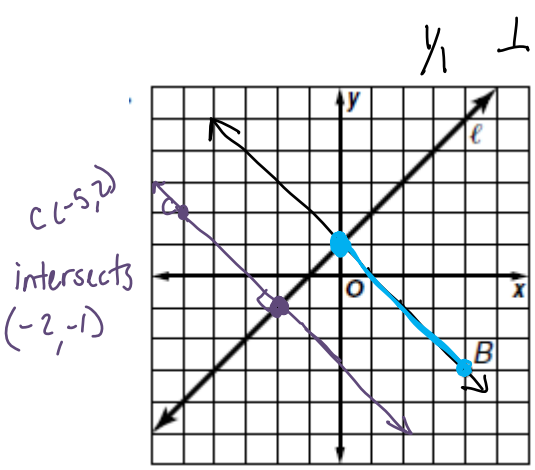




- Graph the line that contains Q(5,1) and is perpendicular to $\overleftrightarrow{MN}$ with M(-2,4) and N(2,1) on the graph above. $-\frac{3}{4}$ $= -\frac{3}{4}$



Create the line perpendicular to *l* through *B*. Then find the distance from *B* to *l*.



$y_1 \quad \perp \rightarrow -\frac{1}{1}$

C (-5, 2)
intersects
(-2, -1)

B
(4, -3)

intersects ℓ w/ $\perp$ line through B
(0, 1)

$\sqrt{(0-4)^2+(1+3)^2}$

$\sqrt{(-4)^2+4^2}$

$\sqrt{16+16}$

$\sqrt{32} = 4\sqrt{2}$

$\sqrt{32}$
$\sqrt{16}\sqrt{2}$
$4\sqrt{2}$

- *Goals:*
- *You can find the slope and use it to identify parallel and perpendicular lines.*

3.3 Slopes of Lines Worksheet