5.2 Slopes of Parallel and Perpendicular Lines

Thursday, April 27, 2023   8:59 AM
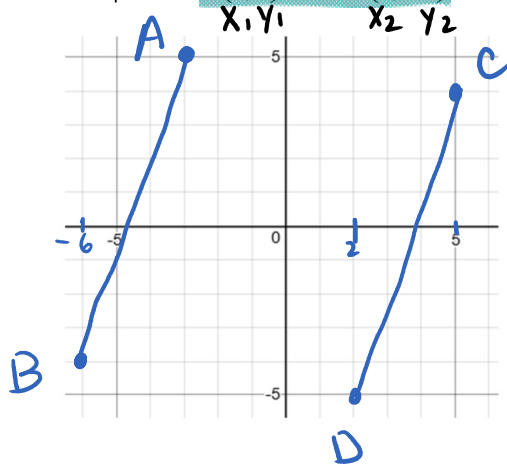
5.2 Slopes of Parallel and Perpendicular Lines

Slope of Parallel Lines

Parallel lines __never__ cross.

Parallel lines have the same __Slope__.

Example 1 : The line AB passes through the points $A\ (-3, 5)$ and $B\ (-6, -4)$. The line CD passes through the points $C\ (5, 4)$ and $D\ (2, -5)$. Graph the points. Are the lines parallel? Justify your answer.

$x_1\ y_1 \qquad x_2\ y_2$

slope AB

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
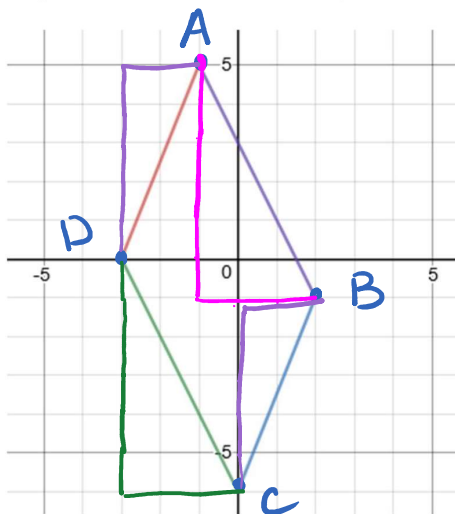
$$m = \frac{-4 - 5}{-6 - (-3)}$$

$$m = \frac{-9 \div -3}{-3 \div -3}$$

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

slope CD

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

$$m = \frac{-9 \div (-3)}{-3 \div (-3)}$$

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

They are parallel
Same Slope

Example 2 : Determine if the quadrilateral is a parallelogram.

Using rise run

Quadrilateral : __4 sided shape__

Parallelogram : __2 sets of parallel sides__
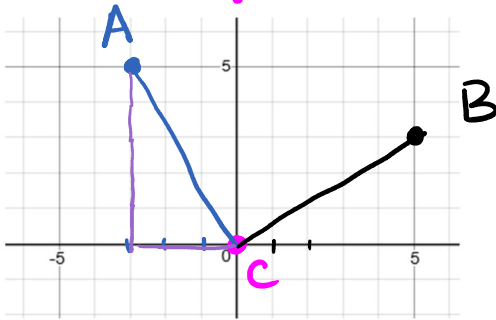(opposite sides parallel)

$$AB = \frac{-6}{3} = -2 \qquad BC = \frac{5}{2}$$

$$CD = \frac{-6}{3} = -2 \qquad AD = \frac{5}{2}$$

AB || CD and BC || AD
So ABCD is a paralleogram

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Example 3 : The line CA passes through the points $A(-3,5)$ and $C(0,0)$. The line CB passes through the points $B(5,3)$ and $C(0,0)$. Graph the points. What is the relationship between slopes of CA and BC

Slope AC
$m = -\dfrac{5}{3}$

Slope BC   BC
$(5,3) \quad (0,0)$
$x_1 \ y_1 \quad x_2 \ y_2$

$m = \dfrac{0-3}{0-5}$

$m = \dfrac{-3 \div (-1)}{-5 \div (-1)}$

$m = \dfrac{3}{5}$

AC is perendicular to BC
$AC \perp BC$

$-\dfrac{5}{3} \cdot \dfrac{3}{5} = \dfrac{-15}{15} = -1$

Slopes of Perpendicular Lines

Two perpendicular lines form a __Right angle__ 90° angle

The product of the slope of two perpendicular lines is __−1__.

For two perpendicular lines, the slope of one is the __negative__ __reciprocal__ of the other.

Example 4 : For each slope below, indicates the slope of a perpendicular line.

a) $\dfrac{2}{3}$ $-\dfrac{3}{2}$

pos   neg

b) $-\dfrac{3}{4} = \dfrac{-3}{4}$ negative

$\dfrac{4}{3}$ positive

c) $\dfrac{-5}{1}$ neg

$\dfrac{1}{5}$ pos

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Intercepts : X-Intercept and Y-Intercept

X-Intercept – The point where the graph crosses the horizontal axis.

The x-intercept is the value of "x" when "y" equals zero.

$$(X, O)$$

x-intercept
(3,0)

Y-Intercept – The point where the graph crosses the vertical axis.

The y-intercept is the value of "y" when "x" equals zero.

$$(O, Y)$$

(0,-6)
y-intercept
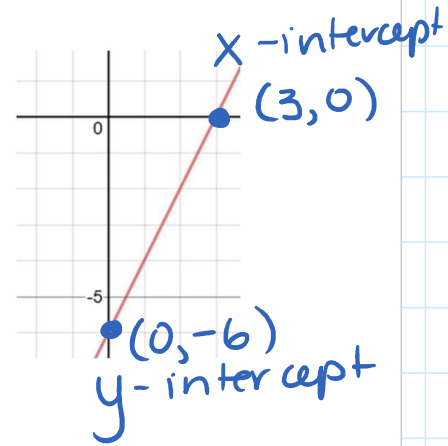
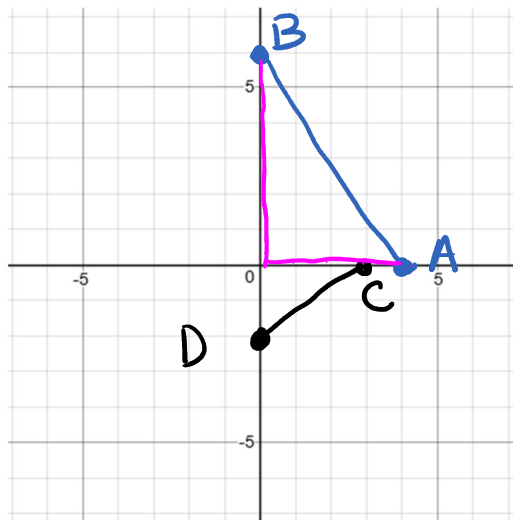**Example 5 :** What is the relationship between the lines (parallel, perpendicular, or neither)? Justify your answer.

Line AB x-intercept is 4 and the y-intercept is 6.

Line CD x-intercept is 3 and the y-intercept is −2.

$$\underline{AB}$$
$$A(4,0)$$
$$B(0,6)$$

$$m = \frac{rise}{run}$$

$$m = \frac{-6}{4} \begin{array}{c}\div 2\\ \div 2\end{array}$$

$$m = -\frac{3}{2}$$

$$CD$$
$$C(3,0)$$
$$D(0,-2)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-2-0}{0-3}$$

$$m = \frac{-2}{-3} \begin{array}{c}\div(-1)\\ \div(-1)\end{array}$$

$$m = \frac{2}{3}$$

$$\frac{-3}{2} \cdot \frac{2}{3} = \frac{-6}{6} = -1$$

$$AB \perp CD$$

Practice : p.348 #3 – 6, 8ab, 9cd, 10, 13

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