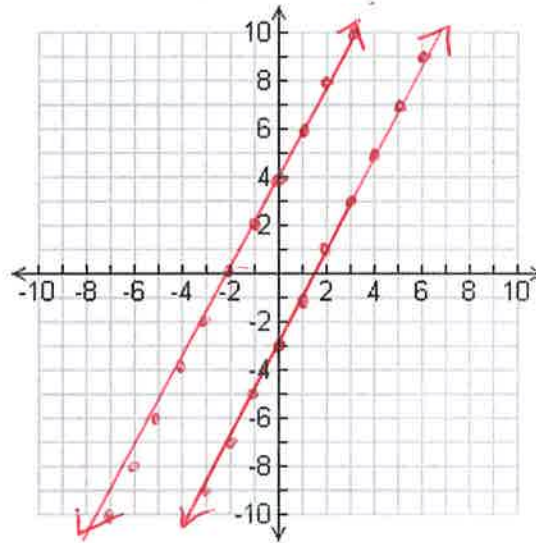


Objective: Identify and graph parallel and perpendicular lines.

Warm Up #1: Graph the given lines on the same coordinate plane.

$$y = 2x - 3$$

$$y = 2x + 4$$



What do you notice about these lines? What is the same? What is different?

Parallel lines (same slope, different y-int)

Warm Up #2: Find the reciprocal of each number.

a.) 2

$$\boxed{\frac{1}{2}}$$

b.) $\frac{1}{3}$

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

c.) -1

$$\frac{-1}{1} = \frac{1}{-1} = \boxed{-1}$$

d.) $-\frac{3}{4}$

$$\boxed{-\frac{4}{3}}$$

Warm Up #3: Find the opposite reciprocal of each number.

a.) -4

$$\boxed{\frac{1}{4}}$$

b.) $\frac{1}{2}$

$$\boxed{-2}$$

c.) 5

$$\boxed{-\frac{1}{5}}$$

d.) $-\frac{2}{3}$

$$\boxed{\frac{3}{2}}$$

Summary:

Parallel lines have the same slope.

Perpendicular lines have opposite reciprocal slopes. (The product of their slopes is -1.)



Example 1: Determine whether the given lines are parallel, perpendicular or neither.

a.) $y = 3x - 1$
 $y = -3x + 4$

$m_1 = 3$

$m_2 = -3$

Neither

b.) $y = \frac{2}{5}x + 2$
 $y = -\frac{5}{2}x - 5$

$m_1 = \frac{2}{5}$

$m_2 = -\frac{5}{2}$

Perpendicular

c.) $y = \frac{1}{2}x$
 $y = \frac{1}{2}x + 6$

$m_1 = \frac{1}{2}$

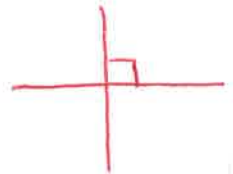
$m_2 = \frac{1}{2}$

Parallel

Special Case: $y = 4$
 $x = 3$

HOY VUX

*Horizontal and vertical lines are perpendicular



↔ * 2 horizontal are parallel

↕ * 2 vertical lines are parallel

Example 2: Identify which lines are parallel.

A. $y = 3x + 2$

$m = 3$

Steps:

1. Put all equations in slope-intercept.
2. Compare the slopes. (If the slopes are the **SAME**, then the lines are parallel).

B. $x + 2y = -4$

$\frac{-x}{2} - \frac{2y}{2} = \frac{-4}{2}$

$\frac{2y}{2} = \frac{-x-4}{2}$

$m = -\frac{1}{2}$

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

C. $y - 5 = 3(x - 1)$

$y - 5 = 3x - 3$
 $+5 \quad +5$

$m = 3$

$y = 3x + 2$

A & C are parallel

Example 3: Identify which lines are perpendicular.

A. $y = -4$

$m = 0$

HOY
Horizontal

B. $y - 6 = 5(x + 4)$

$y - 6 = 5x + 20$

$y = 5x + 26$

$m = 5$

C. $x + 5y = 10$

$-x - 5y = -10$

$\frac{5y}{5} = \frac{-x}{5} + \frac{10}{5}$

$y = -\frac{1}{5}x + 2$

$m = -\frac{1}{5}$

Steps:

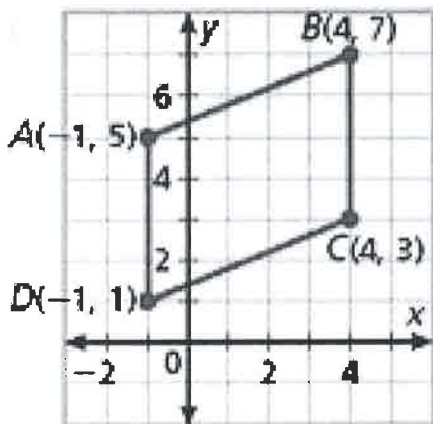
1. Put all equations in slope-intercept form.
2. Compare the slopes. (If the slopes are **OPPOSITE RECIPROCALs**, then the lines are perpendicular.)

B and C are Perpendicular

Example 4: Show that ABCD is a parallelogram.

** A parallelogram is a quadrilateral whose opposite sides are parallel **

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



$m_{AB} = \frac{7-5}{4+1} = \frac{2}{5}$

$m_{AD} = \text{undefined}$

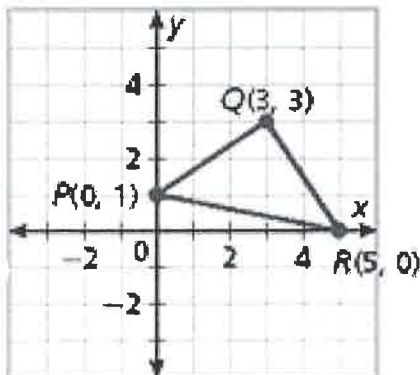
$m_{CD} = \frac{3-1}{4+1} = \frac{2}{5}$

$m_{BC} = \text{undefined}$

It is a parallelogram because AB is parallel to CD and AD is parallel to BC.

Example 5: Show that PQR is a right triangle.

* Can use $\frac{\text{rise}}{\text{run}}$ to find slope



$m_{PQ} = \frac{2}{3}$

$m_{QR} = -\frac{3}{2}$

PQR is a right triangle because PQ is perpendicular to QR

