Comparing slopes:

- ○ **When two lines intersect in a coordinate plane, the steeper line has the slope with the larger absolute value.**

Example 1: If line 1 has a slope of 3/5 and line 2 has a slope of -2/3, line 2 is steeper because $\left|-\frac{2}{3}\right| > \left|\frac{3}{5}\right|$

TRY THESE!

Tell which line through the given points is steeper. You will need to find the slope of each line first!

1. Line 1 : $(-2,3),\ (3,5)$ **2.** Line 3 : $(-2,-1),\ (1,-2)$

     Line 2 : $(3,1),\ (6,5)$ Line 4 : $(-5,-3),\ (-1,-4)$

- ○ You can also compare slopes to tell whether two or more lines are parallel or perpendicular.

POSTULATE 17   SLOPES OF PARALLEL LINES

In a coordinate plane, two nonvertical lines are parallel if and only if they have the same **slope** .

Any two **vertical** lines are parallel.

$m_1 = m_2$

> If the product of two numbers is −1, then the numbers are called *negative reciprocals*.
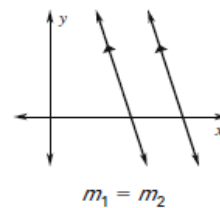
POSTULATE 18   SLOPES OF PERPENDICULAR LINES

In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is **-1** .

Horizontal lines are **perpendicular** to vertical lines.

$m_1 \cdot m_2 = -1$
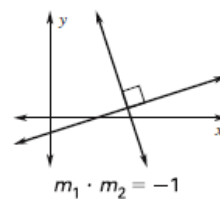
Deciding Whether Lines are Parallel, Perpendicular, or Neither

Example 2: Find the slope of each line. Which lines are parallel?

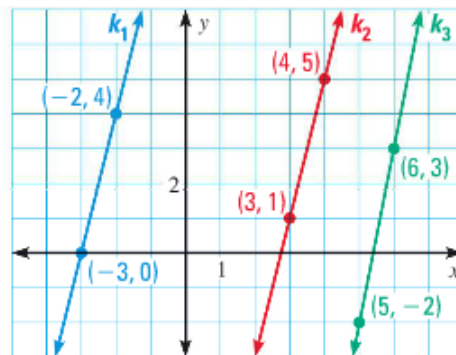   **a.** Find the slope of k_1 through $(-2,4)$ and $(-3,0)$:

$$m_1 = \frac{0-4}{-3-(-2)} = \frac{-4}{-4} = 4$$

    b. Find the slope of k_2 through $(4,5)$ and $(3,1)$:

$$m_2 = \frac{1-5}{3-4} = \frac{-4}{-1} = 4$$

    c. Find the slope of k_3 through $(6,3)$ and $(5,-2)$:

$$m_3 = \frac{-2-3}{5-6} = \frac{-5}{-1} = 5$$

       $\rightarrow$ Compare the slopes. Because k_1 and k_2 have the same slope, they are parallel. The slope of k_3 is different so k_3 is not parallel to the other lines.

TRY THESE!

Tell whether the lines through the given points are *parallel, perpendicular,* or *neither*. You will need to find the slopes of each line first!

3. Line 1 : $(1,0)$, $(7,4)$
    Line 2 : $(7,0)$, $(3,6)$

4. Line 3 : $(-3,1)$, $(-7,-2)$
    Line 4 : $(2,-1)$, $(8,4)$

5. Line 5 : $(-9,3)$, $(-5,7)$
    Line 6 : $(-11,6)$, $(-7,2)$

Answers to Try These!

1. Line 2   2. Line 3   3. Perpendicular, because $\left(\frac{2}{3}\right)\left(-\frac{3}{2}\right) = -1$

4. Neither   5. Perpendicular, because $(1)(-1) = -1$