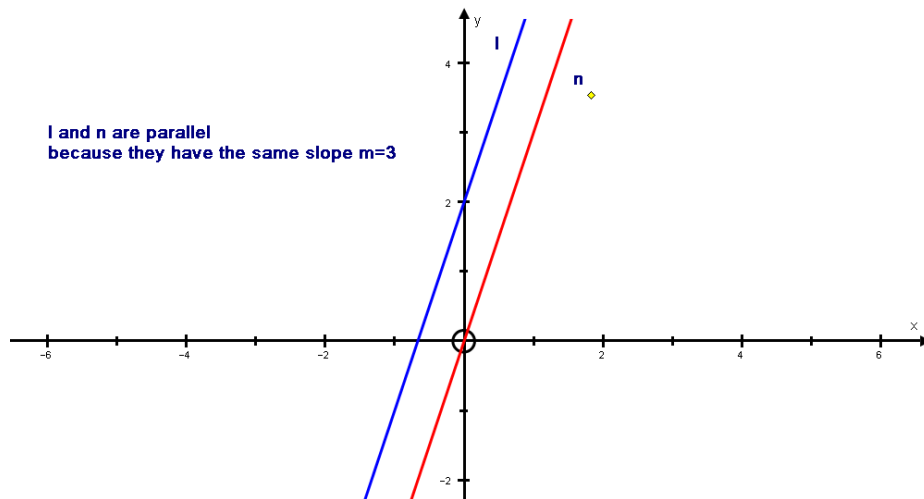# Parallel and Perpendicular Lines

The equations y=3x and y=3x+2 have the same slope. Because 3x is never equal to 3x+2, the value of *y* will never be the same for any given value of *x*, and the graphs will never intersect. These lines are **parallel**.

I and n are parallel
because they have the same slope m=3

Rule 1: If two lines have the same slope, then they are parallel.

$$l \parallel n \Leftrightarrow m_l = m_n$$

In other words, the slopes of parallel lines are equal.
Note that two lines are parallel if there slopes are equal and they have different *y*-intercepts.

Let us consider the two linear functions $y = -3x + 2$ and $y = \frac{1}{3}x - 4$. The slopes are not equal but the product of the two slopes is equal to -1.

I and n are perpendicular
because the product of their slopes is equal
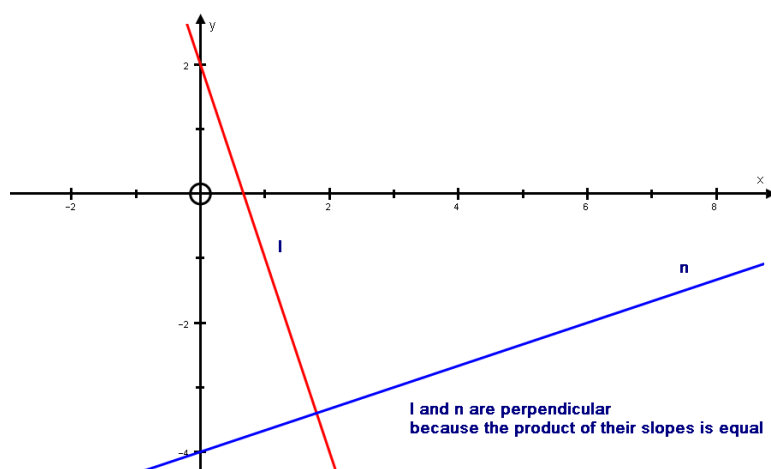
Rule 2: If the product of the slopes of two lines is -1, then the lines are perpendicular.

$$l \perp n \Leftrightarrow m_l \times m_n = -1$$

In other words, slopes of perpendicular lines are negative reciprocals of each other.