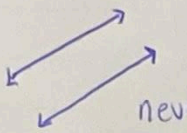
7.4 Parallel & Perpendicular Lines

Parallel Lines

- Slopes are equal

ie $y = 3x + 4$

$y = 3x - 7$



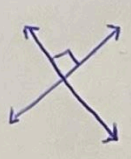
never touch
- stay same distance apart

Perpendicular Lines

- Slopes are opposite-reciprocals of one another. (flipped fraction)

ie $y = \frac{3}{1}x + 4$

$y = -\frac{1}{3}x - 7$



- meet at 90° angle

Example 1 **Identify Parallel and Perpendicular Lines**

State whether the lines in each pair are parallel, perpendicular, or neither. $y = mx + b$

a) $y = 3x - 6$

$y = -\frac{1}{3}x + 4$

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

Perpendicular
- opposite reciprocals.

b) $y = 4x + 3$

$y = 4x - 5$

$m = 4$ $m = 4$

Parallel Lines
- equal slopes.

c) $y = 2x + 6$

$6x + 3y + 3 = 0$

$-6x$ -3

$\frac{3y}{3} = \frac{-6x}{3} - \frac{3}{3}$

$y = -2x - 1$

$m_1 = 2$ $m_2 = -2$

Neither.
- not equal
- not opposite reciprocals.

Example 2 **Write an Equation Involving a Parallel Line**

a) Write the equation of a line that is parallel to $2x - y + 4 = 0$ and through $(1, -6)$. Express the equation in slope-intercept form.

b) Write the equation in general form.

c) Use technology to verify that the lines are parallel.

a) $2x - y + 4 = 0$

$y = 2x + 4$

$m = 2$

$y - y_1 = m(x - x_1)$

$y - (-6) = 2(x - 1)$

$y + 6 = 2x - 2$

$-6 \quad -6$

$y = 2x - 8$

b) $y = 2x - 8$

$0 = 2x - y - 8$

Example 3 **Write an Equation Involving a Perpendicular Line**

Write the equation of a line perpendicular to $3x + 2y - 6 = 0$ with an x-intercept of 9. Express the equation in slope-intercept form and in general form.

$x_{int} = 9$

$(9, 0)$

$3x + 2y - 6 = 0$

$\frac{2y}{2} = -\frac{3}{2}x + \frac{6}{2}$

$y = -\frac{3}{2}x + 3$

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

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

$y - y_1 = m(x - x_1)$

$y - 0 = \frac{2}{3}(x - 9)$

$\left[y = \frac{2}{3}x - 6 \right]^3$

$3y = 2x - 18$

$0 = 2x - 3y - 18$