Unit 4: Writing Equations of Parallel/Perpendicular Lines

Objectives:
- Write the equation of a line that is parallel to a given equation.
- Write the equation of a line that is perpendicular to a given equation.

Name Rogers Notes

Recall from Unit 3: Graphing Lines

- **Parallel lines** have the SAME slope.

  Ex: $y = 3x + 4$ and $-3x + y = -7$ are parallel lines. (Remember to solve for y first to find slope!)

  $m = 3$ $\quad y = 3x + 7$ $\quad m = 3$

- **Perpendicular lines** have slopes that are opposite reciprical (flip the fraction and change the sign).

  Ex: $3y = 5x + 12$ and $y = -\frac{3}{5}x - 5$ are perpendicular lines. (Remember to solve for y first to find slope!)

  $m = 5/3$ $\quad y = \frac{5}{3}x + 12$ $\quad m = -3/5$

5.5 Writing Equations of Parallel Lines

PARALLEL

Example: Write an equation in *standard form* of a line that passes through (–1, 5) and is // to –4x + y = 8.

Step 1: Slope of the original line: 4 (put in $y = mx + b$)

$-4x + y = 8$
$+4x \quad +4x$
$y = 4x + 8$

Step 2: // slope: 4 (NEW SLOPE)

Step 3: Use the point and NEW slope to write an equation in point-slope form:

$y - 5 = 4(x + 1)$
$y - 5 = 4(x + 1)$
$y - 5 = 4x + 4$
$+5 \quad +5$
$y = 4x + 9$

Step 4: Rewrite into standard form:

$y = 4x + 9$
$-4x \quad -4x$
$-4x + y = 9$
(-1)
$4x - y = -9$

You Try: Write an equation in *standard form* of a line that passes through (2, –3) and is // to $y = \frac{-1}{4}x + 5$.

Step 1: Slope of the original line: $-\frac{1}{4}$

Step 2: // slope: $-\frac{1}{4}$

Step 3: Use the point and NEW slope to write an equation in point-slope form:

$y + 3 = -\frac{1}{4}(x - 2)$
$4y + 12 = -1(x - 2)$
$4y + 12 = -x + 2$
$+x \quad -12 \quad +x - 12$

Step 4: Rewrite into standard form:

$x + 4y = -10$

5.5 Writing Equations of Perpendicular Lines

PERPENDICULAR

Example: Write an equation of a line in *standard form* that passes through (5, 1) and is ⊥ to y = –8x + 6.

Step 1: Slope of the original line: –8

Step 2: ⊥ slope: $\frac{1}{8}$

Step 3: Use the point and NEW slope to write an equation in point-slope form:

$y - 1 = \frac{1}{8}(x - 5)$
$8y - 8 = x - 5$
$-x \quad +8 \quad +8$
$-x + 8y = 3$

Step 4: Rewrite into standard form:

$x - 8y = -3$

You Try: Write an equation in ***standard form*** of a line that passes through (5, –6) and is ⊥ to $3y = x + 18$.

Step 1: Slope of the original line: $\frac{1}{3}$

Step 2: ⊥ slope: -3

Step 3: Use the point and NEW slope to write an equation in point-slope form: $y + 6 = -3(x - 5)$

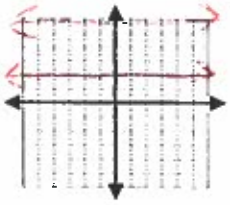
Step 4: Rewrite into standard form: $3x + y = 9$

Special Lines

- **If the lines are** PARALLEL**, the equations start with the same variable**
  - **ex:** $y = 5 \parallel y = 3$ and $x = 2 \parallel x = -4$
- **If the lines are** PERPENDICULAR**, the equations start with the opposite variable.**
  - **ex:** $y = 5 \perp x = 3$ and $x = -4 \perp y = 2$

Example 1: Write an equation of a line in standard form that passes through (4, 6) and is // to y = 2.

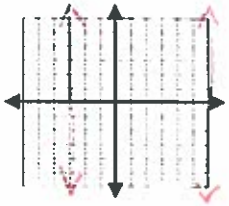
Equation: $y = 6$



HORIZONTAL

You try: Write an equation in standard form of a line that passes through (–3, –1) and is // to x = 6.

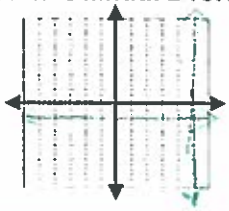
Equation: $x = -3$



VERTICAL

Example 2: Write an equation in standard form of a line that passes through (5, –4) and is ⊥ to y = –1.

Equation: $x = 5$



You try: Write an equation in standard form of a line that passes through (2, –5) and is ⊥ to x = 3.

Equation: $y = -5$