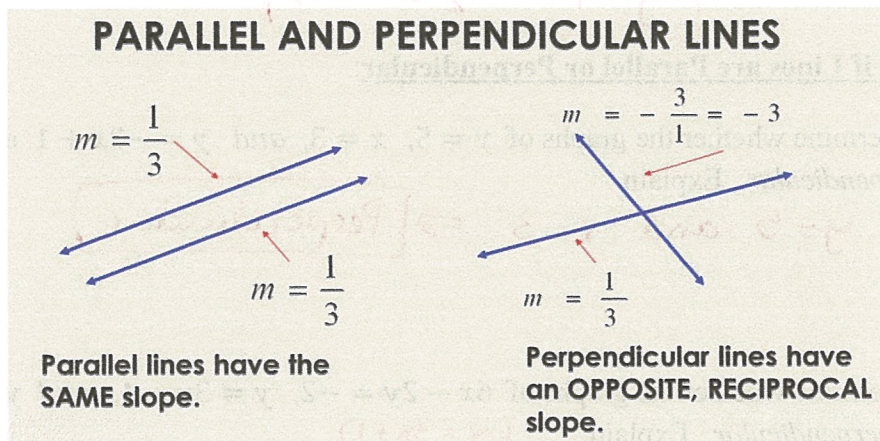


Chapter 4.4 Notes (Parallel and Perpendicular Lines)**Objectives:**

- Find an equation of a line that passes through a given point, parallel to a given line.
- Find an equation of a line that passes through a given point, perpendicular to a given line.

Key Vocabulary:

- **Parallel Lines** – lines in the same plane that do not intersect
 - Parallel lines have the **same slope**.
- **Perpendicular Lines** – lines that intersect at right angles
 - Perpendicular lines have slopes that are **opposite reciprocals**.
 - The product of the slopes is equal to -1.
 - Vertical line (Undefined Slope) is perpendicular to horizontal line ($m=0$)

**Parallel Line Through a Given Point:**

1. Write an equation in *slope-intercept form* for the line that passes through $(-3, 5)$ and is *parallel* to the graph of $y = 2x - 4$.

slope = 2, point $(-3, 5)$
 $y - y_1 = m(x - x_1)$ $y - 5 = 2(x + 3)$
 $y - 5 = 2x + 6$
 $y = 2x + 11$

2. Write an equation in *point-slope form* for the line that passes through $(4, -1)$ and is *parallel* to the graph of $y = \frac{1}{4}x + 7$.

slope = $\frac{1}{4}$, point = $(4, -1)$
 $y - (-1) = \frac{1}{4}(x - 4) \Rightarrow y + 1 = \frac{1}{4}(x - 4)$

Perpendicular Line Through a Given Point:

3. Write an equation in *slope-intercept form* for the line that passes through $(-4, 6)$ and is *perpendicular* to the graph of $y = -\frac{2}{3}x + 4$.

$$\text{Slope} = \frac{3}{2}, \text{ point } (-4, 6)$$

$$y - y_1 = m(x - x_1) \rightarrow y - 6 = \frac{3}{2}x + 6$$

$$y - 6 = \frac{3}{2}(x + 4) \rightarrow \boxed{y = \frac{3}{2}x + 12}$$

4. Write an equation in *point-slope form* for the line that passes through $(4, 7)$ and is *perpendicular* to the graph of $y = \frac{2}{3}x - 1$.

$$\text{Slope} = -\frac{3}{2}, \text{ point } (4, 7)$$

$$\boxed{y - 7 = -\frac{3}{2}(x - 4)}$$

Determine if Lines are Parallel or Perpendicular:

5. Determine whether the graphs of $y = 5$, $x = 3$, and $y = -2x + 1$ are *parallel* or *perpendicular*. Explain.

$$y = 5 \text{ and } x = 3 \Rightarrow \boxed{\text{Perpendicular}}$$

6. Determine whether the graphs of $6x - 2y = -2$, $y = 3x - 4$, and $y = 4$ are *parallel* or *perpendicular*. Explain. ($y = 3x + 1$)

$$6x - 2y = -2$$

$$-2y = -6x - 2$$

$$y = 3x + 1$$

$$6x - 2y = -2 \text{ and } y = 3x - 4$$

$$\Rightarrow \boxed{\text{Parallel}} \text{ (both have } m = 3)$$

Application: The outline of a company's new logo is shown on a coordinate plane.

7. Is $\angle DFE$ a right angle in the logo?

$$\text{slope of } \overline{DA} = \frac{\text{rise}}{\text{run}} = \frac{5}{2}$$

$$\text{slope of } \overline{BE} = \frac{\text{rise}}{\text{run}} = -\frac{2}{5}$$

$\boxed{\text{Yes}}$

8. Is each pair of opposite sides parallel? Explain.

$\boxed{\text{Yes}}$

\overline{CA} and \overline{GE} parallel to y -axis

\overline{AE} and \overline{CG} parallel to x -axis

