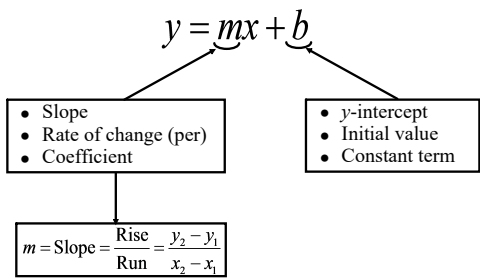


### 3.5 - Slopes of Parallel and Perpendicular Lines

#### Slope-Intercept Form - Review



$A(2,4) \quad B(-7,1)$

Step 1: Find the slope

$$m = \frac{1-4}{-7-2} = \frac{-3}{-9} = \frac{1}{3}$$

Step 2: Use the slope and a single point to find the y-intercept.

$$y = mx + b \quad 4 = \left(\frac{1}{3}\right) \cdot 2 + b \quad \frac{12}{3} = \frac{2}{3} + b \quad b = \frac{10}{3}$$

$$1 = \left(\frac{1}{3}\right) \cdot -7 + b \quad \frac{3}{3} = \frac{-7}{3} + b \quad b = \frac{10}{3}$$

Step 3: Plug the slope and y-intercept into the equation  $y = mx + b$

$$y = \frac{1}{3}x + \frac{10}{3}$$

#### Example 1: With help

Find an equation of the line that has a slope of  $-\frac{1}{7}$  and passes through the point (5,2).

$$y = mx + b$$

$$2 = -\frac{1}{7}(5) + b$$

$$2 = -\frac{5}{7} + b$$

$$b = 2\frac{5}{7} \text{ or } \frac{19}{7}$$

$$y = -\frac{1}{7}x + \frac{19}{7}$$

#### Example 2: On your own

Find the equation of the line in slope-intercept form that passes through the points  $P(-7,2)$  and  $R(1,-4)$ .

$$m = \frac{2 - (-4)}{-7 - 1} = \frac{6}{-8} = -\frac{3}{4}$$

$$y = mx + b$$

$$2 = -\frac{3}{4}(-7) + b$$

$$2 = \frac{21}{4} + b$$

$$b = -3\frac{1}{4} \text{ or } -\frac{13}{4}$$

$$y = -\frac{3}{4}x - \frac{13}{4}$$

$$m = \frac{-4 - 2}{1 - (-7)} = \frac{-6}{8} = -\frac{3}{4}$$

$$y = mx + b$$

$$-4 = -\frac{3}{4} \cdot 1 + b$$

$$-\frac{16}{4} = -\frac{3}{4} + b$$

$$b = -\frac{13}{4}$$

$$y = -\frac{3}{4}x - \frac{13}{4}$$

Writing the equation of a line in slope-intercept form  $y = mx + b$

**Step 1: Find the slope - How?**

- You are given the slope!
- Find the slope using 2 points and the slope formula (rise/run)
- Compare the slope to another line (What does this mean!?)

Step 2: Use the slope and a single point to find the y-intercept.

Step 3: Plug the slope and y-intercept into the equation.

#### Parallel Lines

Parallel lines have the same slope, but *usually* different y-intercepts.

- Examples of parallel lines

$$y = 4x + 1$$

$$y = 4x + 2$$

**Both have slope of 4**

$$y = \frac{2}{3}x + 1$$

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

**Both have slope of 2/3**

$$x = 5$$

$$x = 0$$

**Both have an undefined slope (vertical)**

## 3.5 - Slopes of Parallel and Perpendicular Lines

### EXAMPLE Writing an Equation of a Parallel Line

Write an equation of the line passing through the point  $(-1, 1)$  that is parallel to the line  $y = 2x - 3$ .

$$\begin{array}{l}
 \downarrow \\
 y = 2x - 3 \\
 m = 2
 \end{array}
 \longrightarrow
 \begin{array}{l}
 y = mx + b \\
 1 = 2(-1) + b \\
 1 = -2 + b \\
 b = 3
 \end{array}
 \longrightarrow
 y = 2x + 3$$

### EXAMPLE Writing an Equation of a Perpendicular Line

Write an equation of the line passing through the point  $(2, 3)$  that is perpendicular to the line  $2x + y = 2$ .

$$\begin{array}{l}
 \downarrow \\
 2x + y = 2 \\
 y = -2x + 2 \\
 m = \frac{1}{2}
 \end{array}
 \longrightarrow
 \begin{array}{l}
 y = mx + b \\
 3 = \frac{1}{2}(2) + b \\
 3 = 1 + b \\
 b = 2
 \end{array}
 \longrightarrow
 y = \frac{1}{2}x + 2$$

### Perpendicular Lines

Perpendicular lines have the slopes that are opposite reciprocals

- > Opposite = different signs
- > Reciprocals = numerator and denominator are flipped

- Examples of perpendicular lines

$$y = \frac{2}{5}x + 2$$

$$y = -\frac{5}{2}x + 1$$

Slopes are opposite reciprocals

$$y = \frac{1}{4}x$$

$$y = -4x + 5$$

Slopes are opposite reciprocals

$$y = 2$$

$$x = -3$$

Perpendicular with one vertical and one horizontal line.

### Homework

- 3.5 p.160 #7-12,14-20 Evens (Day 1)