

Chapter 4.2 Notes (Writing Equations in Slope-Intercept Form)**Objectives:**

- Write an equation of a line in slope-intercept form given the slope and one point.
- Write an equation of a line in slope-intercept form given two points.

Given the Slope and a Point

- Step 1: Find the **y-intercept**.
 - Plug your x-coordinate, y-coordinate, and m into $y = mx + b$. Then, solve for b.
- Step 2: Write the equation in slope-intercept form.
- Example: Write an equation of a line that passes through (2, 1) with a slope of 3.

$$\begin{aligned}
 y &= mx + b \\
 1 &= (3)(2) + b \\
 1 &= 6 + b \\
 -5 &= b
 \end{aligned}$$

$$\begin{aligned}
 m &= 3 \quad ; \quad b = -5 \\
 \boxed{y = 3x - 5}
 \end{aligned}$$

Given Two Points

- Step 1: Find the **slope** of the line containing the given points.
 - Use the slope formula.
- Step 2: Use either point to find the **y-intercept**.
 - Plug your x-coordinate, y-coordinate, and m into $y = mx + b$. Then, solve for b.
- Step 3: Write the equation in slope-intercept form.
- Examples: Write an equation of the line that passes through each pair of points.

a) (3, 1) and (2, 4)

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

$$y = mx + b, \text{ use } (3, 1)$$

$$\Rightarrow 1 = -3(3) + b$$

$$1 = -9 + b$$

$$10 = b$$

$$m = -3, \quad b = 10$$

$$\boxed{y = -3x + 10}$$

b) (-4, -2) and (-5, -6)

$$m = \frac{-6 - (-2)}{-5 - (-4)} = \frac{-4}{-1} = 4$$

$$y = mx + b, \text{ use } (-4, -2)$$

$$-2 = 4(-4) + b$$

$$-2 = -16 + b$$

$$14 = b$$

$$m = 4, \quad b = 14$$

$$\boxed{y = 4x + 14}$$

Linear Extrapolation – make predictions about values that are beyond the range of the data

- Example 1: In addition to his weekly salary, Ethan is paid \$16 per delivery. Last week, he made 5 deliveries, and his total pay was \$215.

- a) Write a linear equation (in slope-intercept form) to find Ethan's total weekly pay T if he makes d deliveries.

Point: $(5, 215)$ ← \$215 for 5 deliveries

Slope: 16

$$\begin{aligned} 215 &= 16(5) + b \\ 215 &= 80 + b \\ 135 &= b \end{aligned}$$

$$T = 16d + 135$$

- b) Predict how much money Ethan will earn in a week if he makes 8 deliveries.

$$\begin{aligned} P &= 16(8) + 135 \\ &= \boxed{\$263} \end{aligned}$$

- Example 2: The table shows the number of domestic flights in the U.S from 2004 to 2008.

F = # of flights (in millions)

y = year

- a) Write an equation (in slope-intercept form) that could be used to predict the number of flights if it continues to decrease at the same rate.

$$\text{Slope} = \frac{9.37 - 9.97}{2008 - 2004} = \frac{-0.6}{4} = -0.15$$

Year	Flights (millions)
2004	9.97
2005	10.04
2006	9.71
2007	9.84
2008	9.37

Point: $(2008, 9.37)$

$$\begin{aligned} 9.37 &= -0.15(2008) + b \\ 9.37 &= -301.2 + b \\ 310.57 &= b \end{aligned}$$

$$F = -0.15y + 310.57$$

- b) Estimate the number of domestic flights in 2020.

$$F = -0.15(2020) + 310.57$$

$$= \boxed{7.57 \text{ million}}$$