

Homework 3 Solutions

Slope, Equations of Lines, and Graphing

MATH 1215 • Complete worked solutions

Goal. Write each nonvertical line in slope-intercept form, $y = mx + b$, and show the algebra used to obtain the slope and intercept. For a vertical line, slope-intercept form is not possible.

Part I: Find the Equation and Graph

1. Through the points $(3, -2)$ and $(-6, -8)$

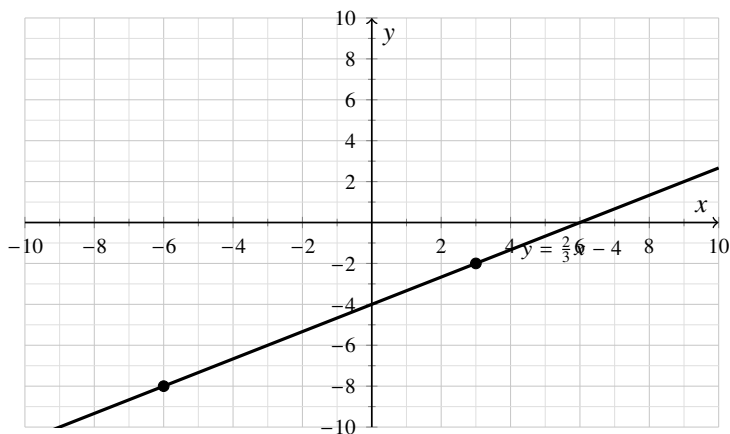
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - (-2)}{-6 - 3} = \frac{-6}{-9} = \frac{2}{3}.$$

Use $y = mx + b$ with $(3, -2)$:

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

Equation:

$$y = \frac{2}{3}x - 4$$



Part I: Find the Equation and Graph (continued)**2. Through the points $(-6, 10)$ and $(9, -10)$**

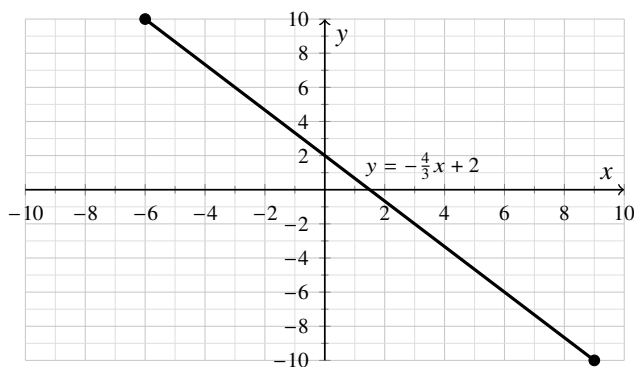
$$m = \frac{-10 - 10}{9 - (-6)} = \frac{-20}{15} = -\frac{4}{3}.$$

Using $(-6, 10)$:

$$10 = -\frac{4}{3}(-6) + b = 8 + b \implies b = 2.$$

Equation:

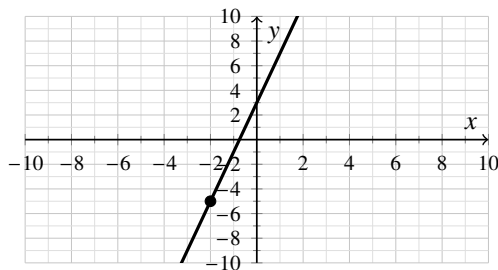
$$y = -\frac{4}{3}x + 2$$

**3. Slope $m = 4$, passing through $(-2, -5)$**

$$y = 4x + b, \quad -5 = 4(-2) + b = -8 + b, \quad b = 3.$$

Equation:

$$y = 4x + 3$$



Part I: Find the Equation and Graph (continued)

4. $16x - 4y = 36$

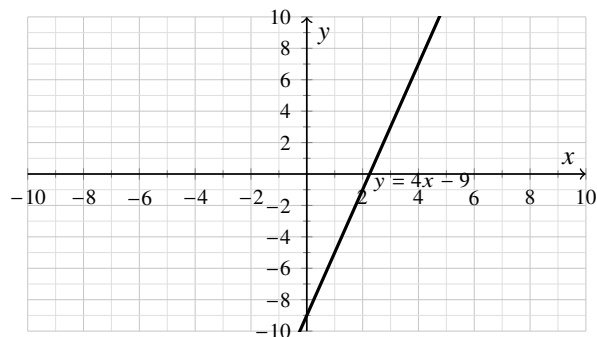
$$16x - 4y = 36$$

$$-4y = 36 - 16x$$

$$y = -9 + 4x.$$

Slope-intercept form:

$$y = 4x - 9$$



5. $8x + 24y = 96$

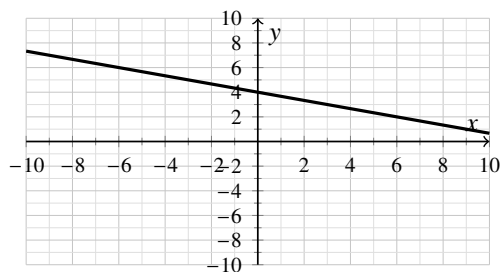
$$8x + 24y = 96$$

$$24y = 96 - 8x$$

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

Slope-intercept form:

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



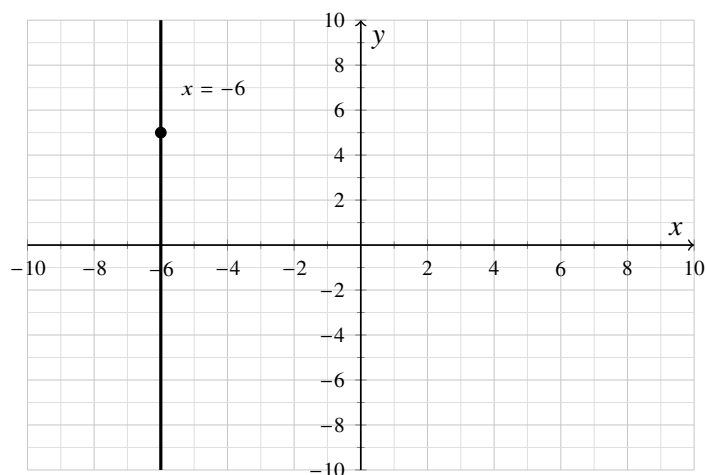
Part I: Find the Equation and Graph (continued)

6. Find the equation of the vertical line passing through $(-6, 5)$.

A vertical line has the same x -coordinate at every point. Since the given point has $x = -6$,

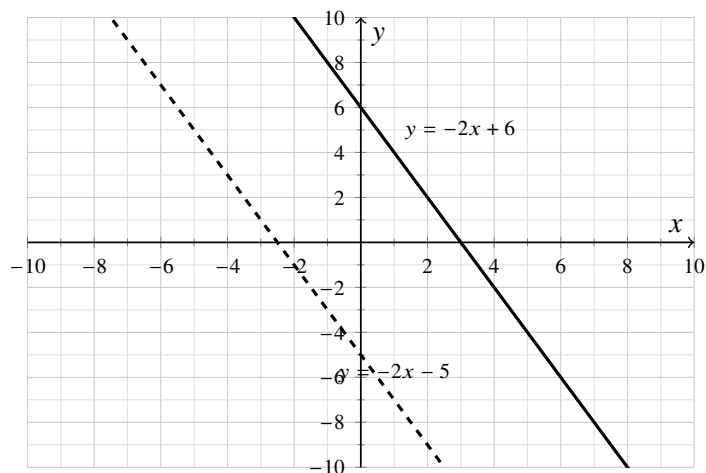
Equation: $x = -6$

This line cannot be written in slope-intercept form because its slope is undefined.

**Part II: Graphing Lines**

(a) Graph $y = -2x + 6$ and $y = -2x - 5$ on the same coordinate plane.

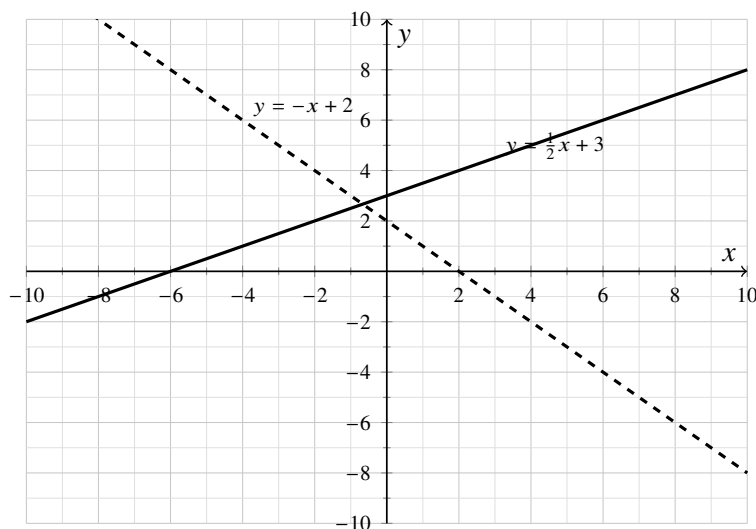
Both lines have slope -2 , so they are parallel. Their y -intercepts are 6 and -5 .



Part II: Graphing Lines (continued)

(b) Graph $y = \frac{1}{2}x + 3$ and $y = -x + 2$ on the same coordinate plane.

For $y = \frac{1}{2}x + 3$, the slope is $\frac{1}{2}$ and the y-intercept is 3. For $y = -x + 2$, the slope is -1 and the y-intercept is 2.



Part III: Equations of Parallel and Perpendicular Lines

(a) Use the points $(-5, 13)$ and $(3, -3)$.

$$m = \frac{-3 - 13}{3 - (-5)} = \frac{-16}{8} = -2.$$

Using $(-5, 13)$:

$$13 = -2(-5) + b = 10 + b \implies b = 3.$$

$$y = -2x + 3$$

Part III: Equations of Parallel and Perpendicular Lines (continued)

(b) Parallel to $y = 3x - 2$ and passing through $(-2, 1)$.

Parallel lines have the same slope, so $m = 3$.

$$y = 3x + b, \quad 1 = 3(-2) + b = -6 + b, \quad b = 7.$$

$$y = 3x + 7$$

(c) Perpendicular to $y = 2x - 1$ and passing through $(4, 5)$.

The given line has slope 2, so the perpendicular slope is the negative reciprocal:

$$m_{\perp} = -\frac{1}{2}.$$

Then

$$y = -\frac{1}{2}x + b, \quad 5 = -\frac{1}{2}(4) + b = -2 + b, \quad b = 7.$$

$$y = -\frac{1}{2}x + 7$$

Part IV: Application

(a) Julio's weight

Julio gains 0.2 kg per day and weighs 40 kg after 14 days.

i. Identify the variables.

d = number of days

w = Julio's weight in kilograms

ii. Identify the slope and point.

$$m = 0.2,$$

$$(14, 40).$$

iii. Write an equation relating w to d .

$$w = 0.2d + b.$$

Substitute $(14, 40)$:

$$40 = 0.2(14) + b = 2.8 + b \implies b = 37.2.$$

$$w = 0.2d + 37.2$$

Part IV: Application (continued)

iv. How long will it take Julio to reach 50 kg?

$$50 = 0.2d + 37.2$$

$$12.8 = 0.2d \implies d = 64.$$

Julio reaches 50 kg on **day 64**. Since he is already at day 14 in the given information, that is **50 additional days** after the stated measurement.

(b) Gym membership

A gym membership has a one-time registration fee of \$35 plus \$20 per month.

i. Write an equation relating total cost C to number of months m .

$$C = 20m + 35.$$

$$C = 20m + 35$$

ii. Find the total cost after 8 months.

$$C = 20(8) + 35 = 160 + 35 = 195.$$

$$C = \$195$$

End of Homework 3 Solutions