

4.5 Find Slope Given an Equation

Key Terms and Concepts

The equation of a line is most commonly written in **slope-intercept form**: $y = mx + b$. In this form, **m** (the coefficient of x) represents the **slope** of the line and **b** is the **y-intercept**. The **y-intercept** is the value of y at the point where the line intersects the y -axis.

Transforming an equation into slope-intercept form

If the equation is not already in slope-intercept form, you will need to transform the equation by solving for y in terms of x .

Examples: To transform the equations $y + 2x = 4$ and $3y = 2x - 9$,

$$\begin{array}{r} y + 2x = 4 \\ \underline{-2x \quad -2x} \\ y = -2x + 4 \end{array} \qquad \begin{array}{r} 3y = 2x - 9 \\ \underline{\quad \quad \quad 3} \\ y = \frac{2}{3}x - 3 \end{array}$$

If two distinct lines have the **same slope**, they are **parallel**. So, to determine whether two lines are parallel, write each equation in *slope-intercept form* to determine whether the slopes are the same for both equations.

Model Problem 1: transforming an equation

What is the slope of the line whose equation is $2y - 3x = x + 2$?

Solution:

$$\begin{array}{r} 2y - 3x = x + 2 \\ \text{(A) } \quad \underline{+3x \quad +3x} \\ \quad \quad \quad 2y = 4x + 2 \\ \quad \quad \quad \underline{\quad \quad \quad 2} \\ \quad \quad \quad y = 2x + 1 \end{array}$$

(B) Slope is 2

Explanation of steps:

- (A) If the equation is not already in slope-intercept form, transform it by solving for y in terms of x . [Add $3x$ to both sides, then divide each by 2.]
- (B) For an equation in slope-intercept form, the slope is the coefficient of x [the slope is 2].

REGENTS QUESTIONS

$y = mx + b$
 Slope \rightarrow m
 b \rightarrow y-intercept

Multiple Choice

1. The line represented by the equation $2y - 3x = 4$ has a slope of

- (1) $-\frac{3}{2}$ (3) 3
 (2) 2 (4) $\frac{3}{2}$

$$\begin{aligned} 2y - 3x &= 4 \\ +3x &+3x \\ \hline 2y &= 3x + 4 \\ \frac{2y}{2} &= \frac{3x}{2} + \frac{4}{2} \\ y &= \frac{3}{2}x + 2 \end{aligned}$$

2. Which equation represents a line that is parallel to the line whose equation is $2x - 3y = 9$?

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

$$\begin{aligned} 2x - 3y &= 9 \\ -2x &-2x \\ \hline -3y &= -2x + 9 \\ \frac{-3y}{-3} &= \frac{-2x}{-3} + \frac{9}{-3} \\ y &= \frac{2}{3}x - 3 \end{aligned}$$

3. What is the slope of the line represented by the equation $4x + 3y = 12$?

- (1) $\frac{4}{3}$ (3) $-\frac{3}{4}$
 (2) $\frac{3}{4}$ (4) $-\frac{4}{3}$

$$\begin{aligned} 4x + 3y &= 12 \\ -4x &-4x \\ \hline 3y &= -4x + 12 \\ \frac{3y}{3} &= \frac{-4x}{3} + \frac{12}{3} \\ y &= -\frac{4}{3}x + 4 \end{aligned}$$

4. Which equation represents a line that is parallel to the line whose equation is $y = -3x - 7$?

- (1) $y = -3x + 4$ (3) $y = \frac{1}{3}x + 5$
 (2) $y = -\frac{1}{3}x - 7$ (4) $y = 3x - 2$

Slope = -3

5. What is the slope of a line represented by the equation $2x = x - 4$?

- (1) 1 (3) -1
 (2) 2 (4) $-\frac{1}{2}$

$$\begin{aligned} 2x &= x - 4 \\ -x &-x \\ \hline x &= -4 \end{aligned}$$

Slope = -3

6. Which equation represents a line that is parallel to the line whose equation is $y = -3x + 0$?

- (1) $\frac{1}{3}x + y = 4$ (3) $6x + 2y = 4$
 (2) $-\frac{1}{3}x + y = 4$ (4) $-6x + 2y = 4$

$$\begin{aligned} 6x + 2y &= 4 \\ -6x &-6x \\ \hline 2y &= -6x + 4 \end{aligned}$$

7. What is the slope of the line represented by the equation $4x + 3y = 7$?

- (1) $\frac{7}{4}$ (3) $-\frac{3}{4}$
 (2) $\frac{7}{3}$ (4) $-\frac{4}{3}$

$$\begin{aligned} 4x + 3y &= 7 \\ -4x &-4x \\ \hline 3y &= -4x + 7 \\ \frac{3y}{3} &= \frac{-4x}{3} + \frac{7}{3} \\ y &= -\frac{4}{3}x + \frac{7}{3} \end{aligned}$$