

Algebra 1A

Lesson 5.5

Write Equations of Parallel and Perpendicular Lines

Warm-Up

Determine if the given lines are parallel or not based on the slope.

(a) $y = \frac{2}{3}x + 5$
 $y = \frac{2}{3}x - 8$

YES, BOTH SLOPES ARE $\frac{2}{3}$

(b) $y - 2 = 2x + 2 \rightarrow y = 2x + 4$
 $2x + y = 7 \rightarrow y = -2x + 7$

NO, ONE SLOPE IS 2 AND THE OTHER IS -2

(c) $y = \frac{4}{3}x - 8$
 $-4x + 3y = 9$
 $+4x \quad +4x$
 $\frac{3y}{3} = \frac{4x+9}{3}$
 $y = \frac{4}{3}x + 3$

YES, BOTH SLOPES ARE $\frac{4}{3}$

Parallel Lines

- If two nonvertical lines have the same slope, then they are parallel
- If two nonvertical lines are parallel, then they have the same slope

Example 1. Write an Equation of a Parallel Line

Write an equation of a line that passes through $(-3, 3)$ and is parallel to the line $y = -2x + 1$.

NEW LINE: $m = -2$
 POINT: $(-3, 3)$

$y - 3 = -2(x + 3)$
 $y - 3 = -2x - 6$
 $+3 \quad +3$

$y = -2x - 3$

Perpendicular Lines

- If two nonvertical lines have slopes that are opposite reciprocals, then they are perpendicular
- If two nonvertical lines are perpendicular, then they have opposite reciprocal slopes

Example 2. Find Perpendicular Lines

Give the slope that is perpendicular to the given slope.

(a) $m = 2$

$-\frac{1}{2}$

(b) $m = \frac{3}{5}$

$-\frac{5}{3}$

(c) $m = -6$

$\frac{1}{6}$

(d) $m = -\frac{7}{4}$

$\frac{4}{7}$

// "is parallel to"

⊥ "is perpendicular to"

Example 3. Determine if the Lines are Parallel, Perpendicular or Neither

Line a: $-x + 3y = 1$

Line b: $y = -3x + 1$

Line c: $2x - 6y = 4$

$+x \quad +x$

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

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

Lines a and c are parallel

Line b is perpendicular to both lines a and c

$-2x \quad -2x$
 $-6y = -2x + 4$
 $\frac{-6y}{-6} = \frac{-2x+4}{-6}$

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

Example 4. Write an Equation of a Perpendicular Line

Write an equation of the line that passes through (4,-2) and is perpendicular to the line $y = 4x + 2$.

New line: $m = -\frac{1}{4}$
 POINT: (4, -2)

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

$y + 2 = -\frac{1}{4}x + 1$
 $-2 \quad -2$

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

a // c
 b ⊥ a
 b ⊥ c

Try It!

(a) Write an equation of the line that passes through (-2, 11) and is parallel to the line $y = -x + 5$.

(b) Write an equation of the line that passes through (4, 3) and is perpendicular to the line $y = -2x - 7$.

New line: $m = -1$
 POINT: (-2, 11)

$y - 11 = -1(x + 2)$

$y - 11 = -x - 2$
 $+11 \quad +11$

$y = -x + 9$

New line: $m = \frac{1}{2}$
 POINT: (4, 3)

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

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

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

Assignment

New: Page 322 #4-32 (evens)

Review:

- A tailor charges a \$15 fee plus \$2.50 a letter to sew a name onto a jacket. The equation $y = 2.5x + 15$ models the total cost (y) of sewing a name with (x) letters. Find the slope and y-intercept of the equation. If your last name was STOCKWELL, how much would it cost to have your name put on a jacket?
- The total cost (y) of a family membership to a health club for (x) months can be modeled by the equation $y = 30x + 75$. How many months of family membership do you have if your family pays \$225?
- A group of dogsledders set off on an expedition with 91 pounds of dog food. The dogs eat 7 pounds of food each day.
 - Write an equation in slope - intercept form to model the remaining dog food (y) in terms of (x) the days of the expedition
 - Copy and complete the table.

Days (x)	3	5	7	9
Food Remaining (y)				
 - How many days will the supply of dog food last?
- You bought a vintage car for \$4500 last year. You are told that the car is worth \$600 more this year, and you should expect the value of the car to increase by \$600 every year.
 - Write an equation that models the total value (y) of the car in terms of the number of years (n).
 - Calculate the value of the car after owning it for seven years.