

Writing Linear Equations

Parallel and Perpendicular Lines Use the slope-intercept or point-slope form to find equations of lines that are parallel or perpendicular to a given line. Remember that parallel lines have equal slope. The slopes of two perpendicular lines are negative reciprocals, that is, their product is -1 .

Example 1 Write an equation of the line that passes through $(8, 2)$ and is perpendicular to the line whose equation is $y = -\frac{1}{2}x + 3$.

The slope of the given line is $-\frac{1}{2}$. Since the slopes of perpendicular lines are negative reciprocals, the slope of the perpendicular line is 2 .

Use the slope and the given point to write the equation.

$$\begin{aligned} y - y_1 &= m(x - x_1) && \text{Point-slope form} \\ y - 2 &= 2(x - 8) && (x_1, y_1) = (8, 2), m = 2 \\ y - 2 &= 2x - 16 && \text{Distributive Prop.} \\ y &= 2x - 14 && \text{Add 2 to each side.} \end{aligned}$$

An equation of the line is $y = 2x - 14$.

Example 2 Write an equation of the line that passes through $(-1, 5)$ and is parallel to the graph of $y = 3x + 1$.

The slope of the given line is 3 . Since the slopes of parallel lines are equal, the slope of the parallel line is also 3 .

Use the slope and the given point to write the equation.

$$\begin{aligned} y - y_1 &= m(x - x_1) && \text{Point-slope form} \\ y - 5 &= 3(x - (-1)) && (x_1, y_1) = (-1, 5), m = 3 \\ y - 5 &= 3x + 3 && \text{Distributive Prop.} \\ y &= 3x + 8 && \text{Add 5 to each side.} \end{aligned}$$

An equation of the line is $y = 3x + 8$.

Prob Set 1

Exercises

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

- passes through $(-4, 2)$, parallel to the line whose equation is $y = \frac{1}{2}x + 5$
- passes through $(3, 1)$, perpendicular to the graph of $y = -3x + 2$
- passes through $(1, -1)$, parallel to the line that passes through $(4, 1)$ and $(2, -3)$
- passes through $(4, 7)$, perpendicular to the line that passes through $(3, 6)$ and $(3, 15)$
- passes through $(8, -6)$, perpendicular to the graph of $2x - y = 4$
- passes through $(2, -2)$, perpendicular to the graph of $x + 5y = 6$
- passes through $(6, 1)$, parallel to the line with x -intercept -3 and y -intercept 5
- passes through $(-2, 1)$, perpendicular to the line $y = 4x - 11$

Prob Set 2

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

10. slope -5 , passes through $(-3, -8)$

11. slope $\frac{4}{5}$, passes through $(10, -3)$

12. slope 0 , passes through $(0, -10)$

13. slope $-\frac{2}{3}$, passes through $(6, -8)$

14. passes through $(3, 11)$ and $(-6, 5)$

15. passes through $(7, -2)$ and $(3, -1)$

16. x -intercept 3 , y -intercept 2

17. x -intercept -5 , y -intercept 7

18. passes through $(-8, -7)$, perpendicular to the graph of $y = 4x - 3$

Solutions:

Prob Set 1

1. -

2. -

3.

4.

5. -

6.

7. -

8. - -

Prob Set 2

10.

11. -

12.

13. -

14. -

15. - -

16. -

17. -

18. -