

3.4 Find and Use Slopes of Lines

- Before** You used properties of parallel lines to find angle measures.
- Now** You will find and compare slopes of lines.
- Why?** So you can compare rates of speed as in Example 4.

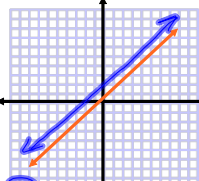
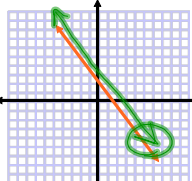
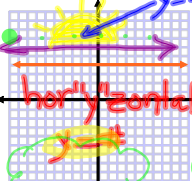
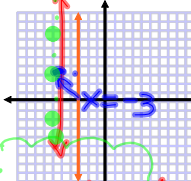
RECALL:

Slope-Intercept: $y = mx + b$ (x, y) = a point on the line
 ↓ slope ↓ y-intercept

Point Slope Form: $(y - y_1) = m(x - x_1)$
 Point: (x_1, y_1)
 Slope: m

Slope Formula: $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$
 change y rise run change x

Types of Slopes:

 <p>Positive $y = mx + b$ $m = \#$</p>	 <p>Negative $y = mx + b$ $m = -\#$</p>	 <p>horizontal $y = \#$ $m = \frac{0}{\#}$</p>	 <p>undefined $x = \#$ $m = \frac{\#}{0}$</p>
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POSTULATES For Your Notebook

POSTULATE 17 Slopes of Parallel Lines
 In a coordinate plane, two nonvertical lines are parallel if and only if they have the same slope.
 Any two vertical lines are parallel.
 $m_1 = m_2$

POSTULATE 18 Slopes of Perpendicular Lines
 In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is -1.
 $m_1 \cdot m_2 = -1$
 Horizontal lines are perpendicular to vertical lines.

$x \perp y$

Ex. $m = 2$
 $m_1 = -\frac{1}{2}$
 opposite → -2 → reciprocal → $-\frac{1}{2} \cdot 2 = -1$

Ex. $m = \frac{2}{3}$
 $m_1 = \frac{3}{2}$
 opposite → $-\frac{2}{3}$ → reciprocal → $-\frac{2}{3} \cdot \frac{3}{2} = -1$

3.4 Find and Use Slopes of Lines

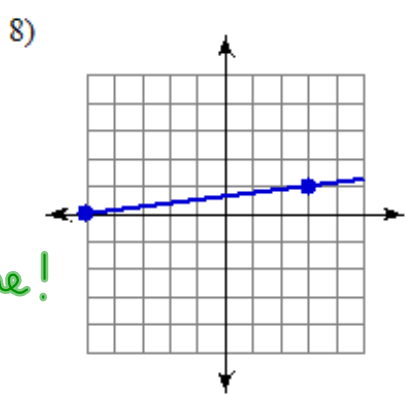
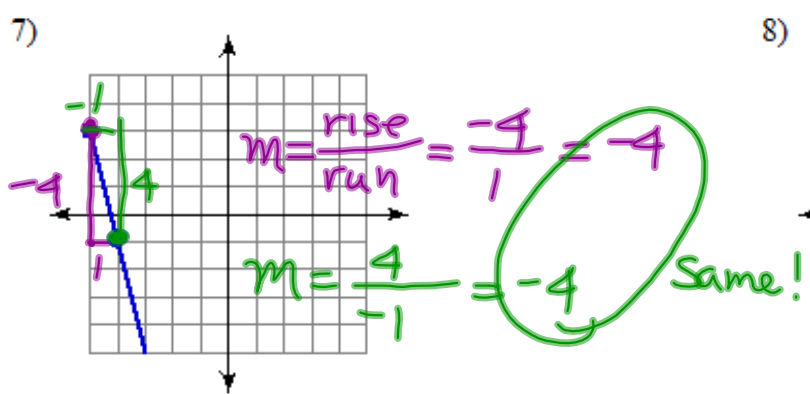
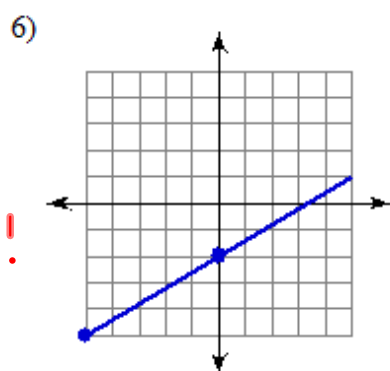
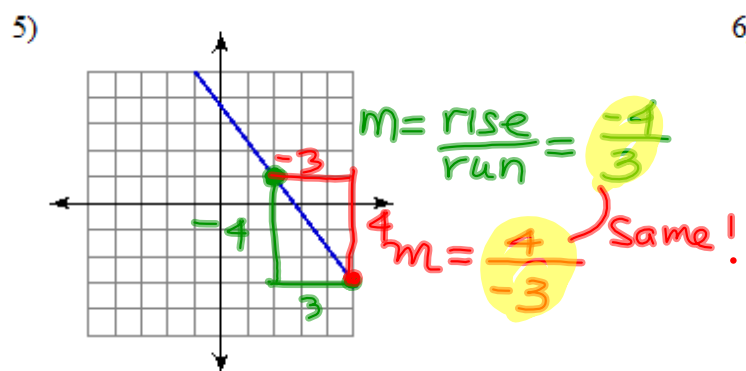
Find the slope of each line. $y = mx + b$ "coefficient of x "

1) $y = -3x - 5$
 $m = -3$

2) $y = -\frac{8}{3}x - 4$

3) $y = 1x - 3$
 $m = 1$

4) $y = \frac{1}{5}x - 3$



Find the slope of the line through each pair of points.

9) $(6, 1), (5, -9)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $m = \frac{-9 - 1}{5 - 6} = \frac{-10}{-1} = 10$

10) $(17, 5), (17, 2)$

11) $(1, -12), (-3, -13)$

12) $(-9, 0), (1, 0)$

$m = \frac{-13 - (-12)}{-3 - 1} = \frac{-1}{-4} = \frac{1}{4}$

Find the slope of a line parallel to each given line.

13) $y = -\frac{1}{5}x + 4$

$m = -\frac{1}{5} \rightarrow m_{||} = \frac{1}{5}$

14) $x = 5$

15) $y = -2x + 5$

$m = -2 \rightarrow m_{||} = 2$

16) $y = -x - 5$

Find the slope of a line perpendicular to each given line.

17) $y = -7x - 3$

$m = -7 \rightarrow$ opposite reciprocal $\rightarrow \frac{1}{7}$
 $m_{\perp} = \frac{1}{7}$

18) $y = \frac{1}{4}x - 5$

19) $x = 4$

$m =$ undefined
 $m_{\perp} =$ zero "0" STOPPED

20) $y = 5x$

Write the slope-intercept form of the equation of the line through the given point with the given slope.

21) through: (4, 0) slope = 1
 $y - y_1 = m(x - x_1)$
 $y - 0 = 1(x - 4)$

$y = x - 4$

$y = mx + b$
 $0 = 1 \cdot 4 + b$
 $0 = 4 + b$
 $-4 = b$

$-4 = b$ and $m = 1$

$y = mx + b$
 $y = 1x - 4$
 $y = x - 4$

22) through: (3, -5), slope = $\frac{5}{2}$

23) through: (-4, 4) slope = $\frac{6}{5}$
 $y - y_1 = m(x - x_1)$

$y + 4 = \frac{6}{5}(x + 4)$
 $y + 4 = \frac{6}{5}x + \frac{6 \cdot 4}{5}$

$y + 4 = \frac{6}{5}x + \frac{24}{5}$
 $y = \frac{6}{5}x + \frac{24}{5} - 4$

$y = \frac{6}{5}x + \frac{24}{5} - \frac{20}{5}$
 $y = \frac{6}{5}x + \frac{4}{5}$

$y = mx + b$
 $-4 = \frac{6}{5} \cdot 4 + b$
 $-4 = \frac{24}{5} + b$
 $-\frac{20}{5} - \frac{24}{5} = b$
 $-\frac{44}{5} = b$

$-\frac{44}{5} = b$

$\frac{4}{5} = b$ and $m = \frac{6}{5}$

$y = mx + b$
 $y = \frac{6}{5}x + \frac{4}{5}$

24) through: (4, -3), slope = $-\frac{3}{5}$

Write the slope-intercept form of the equation of the line described.

25) through: (4, -4), parallel to $y = 7x - 5$

$\infty = m = 7$
 $m_{||} = 7$

$y - y_1 = m(x - x_1)$

$y + 4 = 7(x - 4)$

$y + 4 = 7x - 28$
 $y = 7x - 32$

26) through: (4, -1), parallel to $y = -\frac{1}{2}x - 4$

27) through: $(3, 0)$, parallel to $y = -\frac{2}{3}x + 5$ $\leftarrow m$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = \frac{-2}{3}(x - 3)$$

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

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

28) through: $(3, 4)$, parallel to $y = \frac{1}{3}x + 5$

29) through: $(3, -2)$ perp. to $y = \frac{1}{6}x + 4$

$$y - y_1 = m(x - x_1)$$

$$y + 2 = m(x - 3)$$

$m = -\frac{1}{6} \rightarrow \frac{1}{6} \rightarrow \frac{1}{\frac{1}{6}} = 6$ (opp recip.)

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

$$y + 2 = 6x - 18$$

$$y = 6x - 20$$

30) through: $(-5, 0)$, perp. to $y = x + 3$

31) through: $(3, 2)$ perp. to $y = -\frac{1}{2}x - 3$

$$y - y_1 = m(x - x_1)$$

$$y - 2 = m(x - 3)$$

$m = -\frac{1}{-\frac{1}{2}} = 2$ (opp recip.)

$$y - 2 = 2(x - 3)$$

$$y - 2 = 2x - 6$$

$$y = 2x - 4$$

32) through: $(-4, -1)$, perp. to $y = 2x + 3$

Write the slope-intercept form of the equation of the line through the given points.

33) through: $(0, -2)$ and $(2, 2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{2 - (-2)}{2 - 0} = \frac{4}{2} = 2$$

$$y - y_1 = m(x - x_1)$$

$$y + 2 = 2(x - 0)$$

$$y + 2 = 2x$$

$$y = 2x - 2$$

34) through: $(4, -5)$ and $(0, -3)$

35) through: $(0, -1)$ and $(-2, -2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - (-1)}{-2 - 0} = \frac{-1}{-2} = \frac{1}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y + 1 = \frac{1}{2}(x - 0)$$

36) through: $(-5, -5)$ and $(0, 0)$

$$y - y_1 = m(x - x_1)$$

$$y + 5 = m(x + 5)$$

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