

Unit 3.4

Bell Work:

1. Decide whether the following is a function.

$(-1, -5)$ $(1, 2)$ $(3, 4)$ $(1, -7)$

NO

What is the domain? The range?

D: $\{-1, 1, 3\}$

R: $\{-7, -5, 2, 4\}$

2. $f(x) = 16 - 7x$ Find $f(-5)$

$$f(-5) = 16 - 7(-5)$$

$$f(-5) = 51$$

↑ input (x-value)

The **SLOPE** of a non vertical line is:

$$\frac{\Delta y}{\Delta x} = \frac{\text{Rise}}{\text{Run}} \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

Find the slope of the given points.

$(4, 6)$ $(4, -1)$

$(-4, 5)$ $(6, -7)$

$$m = \frac{6 - (-1)}{4 - 4} = \frac{7}{0} = \text{undefined}$$

$$m = \frac{5 - (-7)}{-4 - 6} = \frac{12}{-10} = -\frac{6}{5}$$

$$m = \frac{-1 - 6}{4 - 4} = \frac{-7}{0} = \text{undefined}$$

$(2, -3)$ $(0, -3)$

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

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

Rate of Change:

Miles per hour, degrees per day

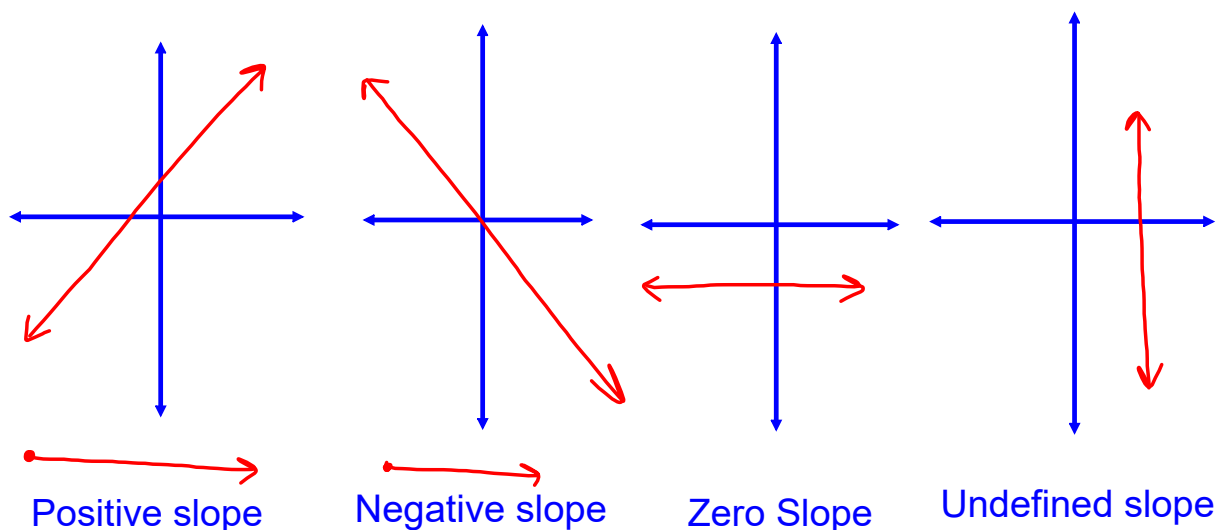
hr \$

(2,12) and (5,30) x is measure in hours and y is measured in dollars.

What is the rate of change?

$$\frac{\text{dollars}}{\text{hour}} = \frac{12-30}{2-5} = \frac{-18}{-3} = 6 \frac{\text{dollars}}{\text{hr}}$$

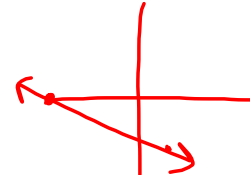
Classify lines by their slope:



Without graphing: Describe the line through the 2 points.

$$(-5, \underset{\uparrow}{1}) \text{ \& } (3, \underset{\uparrow}{1}) = \text{horizontal}$$

$$(-6, 0) \text{ \& } (2, -4) = \text{slanted}$$



$$(\underset{\uparrow}{4}, 6) \text{ \& } (\underset{\uparrow}{4}, -1) = \text{vertical}$$

Parallel Lines

Have the EXACT SAME slope.

$$m_1 = m_2$$

$$\text{Line 1: } (-3, 2) \text{ and } (5, 0) \quad m_1 = \frac{2-0}{-3-5} = \frac{2}{-8} = -\frac{1}{4}$$

$$\text{Line 2: } (-1, -4) \text{ and } (0, 4) \quad m_2 = \frac{-4-4}{-1-0} = \frac{-8}{-1} = 8$$

$$m_1 \neq m_2 \quad \parallel$$

Perpendicular Lines

Have OPPOSITE RECIPROCAL

slopes

$$m_1 = -\frac{1}{m_2}$$

$$m_1 = 4 \perp m_2 = -\frac{1}{4}$$

$$m_1 = -\frac{1}{2} \perp m_2 = 2$$

$$m_1 = 0 \perp m_2 = \text{undef}$$

Line 1: (3, -1) and (6, -4) $m_1 = \frac{-1 - (-4)}{3 - 6} = \frac{3}{-3} = -1$

Line 2: (-4, 5) and (-2, 7)

$$m_2 = \frac{5 - 7}{-4 - (-2)} = \frac{-2}{-2} = 1$$

\perp

Standard form

$$\underbrace{Ax + By}_{(+)} = C$$

Finding intercepts

$$2x + 6y = 12$$

X-intercept / Y=0

$$2x + 6(0) = 12$$

$$2x = 12$$

$$x = 6$$

X-intercept:

$$(6, 0)$$

Y-intercept / X=0

$$2(0) + 6y = 12$$

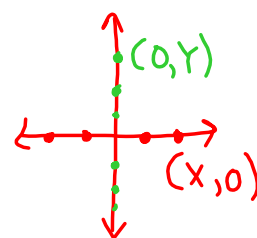
$$6y = 12$$

$$y = 2$$

Y-intercept:

$$(0, 2)$$

X	Y
0	2
6	0



Find the x and y intercepts for the given line.

$$5x + 14y = 10$$

x-int:

$$5x + 14(0) = 10$$

$$5x = 10$$

$$x = 2$$

$$(2, 0)$$

y-int:

$$5(0) + 14y = 10$$

$$14y = 10$$

$$y = \frac{10}{14} = \frac{5}{7}$$

$$(0, \frac{5}{7})$$

★Memorize★

Equation for a horizontal line

$$y = \#$$

Equation for a vertical line

$$x = \#$$

Writing equations of lines

Given the slope and a point:

Point Slope Form:

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

Use idea of transformations instead.

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

or

$$y = mx + b$$

$$y = m(x - 0) + b$$

$$y = a(x - h) + k$$

$$y = a(x - h) + k$$

Know these

$$y = a(x - h) + k$$

$$y = a|x - h| + k$$

$$y = a(x - h)^2 + k$$

$$y = a\sqrt{x - h} + k$$

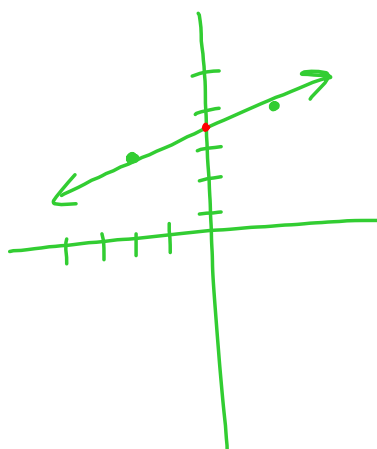
$$y = a\sqrt[3]{x - h} + k$$

Write the equation of a line with a slope $m = 1/4$, and passing through $(-2, 3)$ ←

$$y = a(x - h) + k$$

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

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

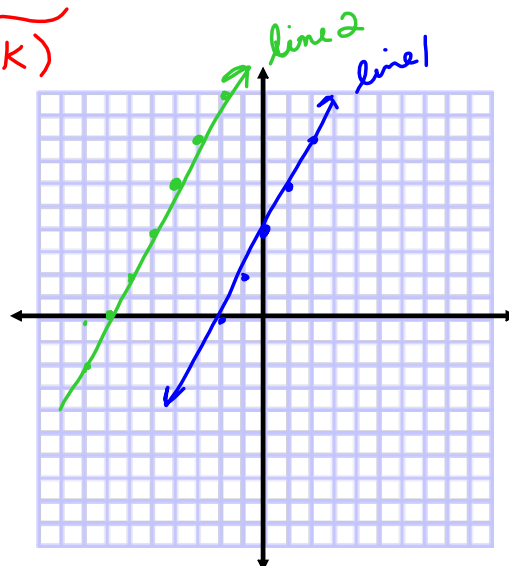


Write and graph an equation of the line that passes through the given point $(-4, 6)$ and parallel to the line $y = 2x + 4$ line 1

line 2 $\Rightarrow m = 2$

$$y = 2(x + 4) + 6$$

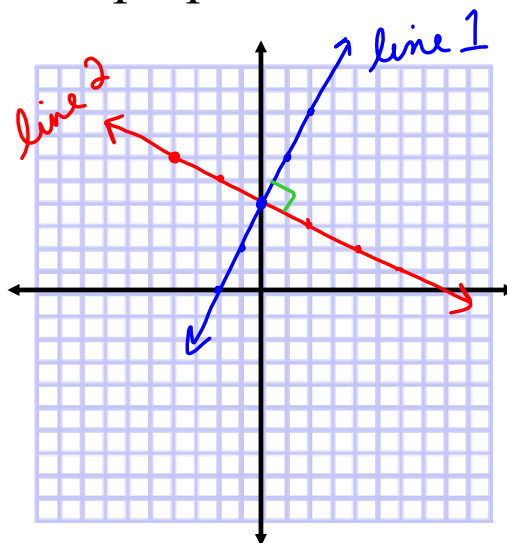
$$y = 2(x + 4) + 6$$



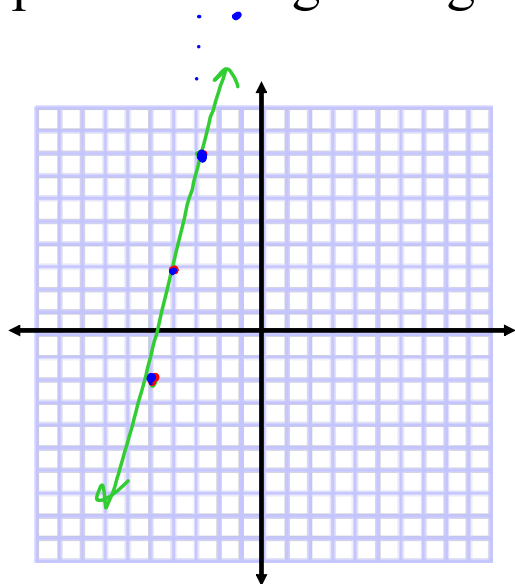
Write and graph an equation of the line that passes through the given point $(-4, 6)$ and perpendicular to the line $y = 2x + 4$ *line 1* ^{h k}
 $m = 2$

$$\text{line 2} \Rightarrow \perp m = -\frac{1}{2}$$

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



Write and graph an equation of the line that passes through the given points. $(-5, -2)$ $(-3, 8)$



$$m = \frac{-2 - 8}{-5 - (-3)} = \frac{-10}{-2} = 5$$

$$y = a(x-h) + k$$

$$y = 5(x + 5) - 2$$

$$y = 5(x + 5) - 2 \quad \star$$

$$y = 5(x + 3) + 8 \quad \star$$

Write an equation of the line that passes through (1, 4) and is:

↑
vert a) parallel to $y = -2$

$$y = 4$$

b) perpendicular to $y = -2$

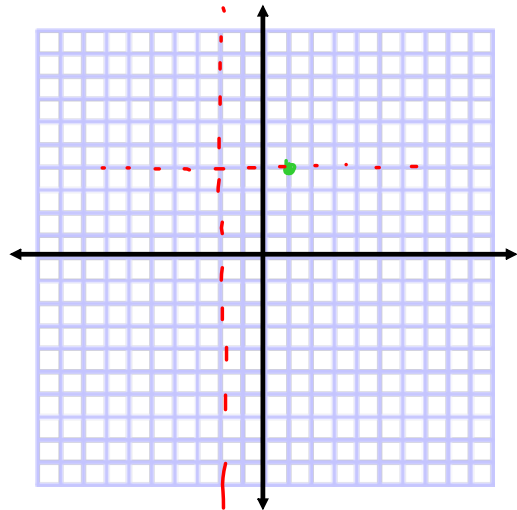
$$x = 1$$

c) parallel to $x = -2$

$$x = 1$$

d) perpendicular to $x = -2$

$$y = 4$$



17. Graph and write the equation of the line through the points $(-4, -1)$ and $(2, 3)$. $\parallel m = 2/3$ $\perp m = -3/2$

What is the domain, range and x and y intercepts of the line?

$$m = \frac{-1-3}{-4-2} = \frac{-4}{-6} = \frac{2}{3} \quad \begin{matrix} D: \mathbb{R} \\ R: \mathbb{R} \end{matrix}$$

a h k

$$y = a(x-h) + k$$

x-int:

$$0 = \frac{2}{3}(x+4) - 1$$

y-int:

$$y = \frac{2}{3}(0+4) - 1$$

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

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

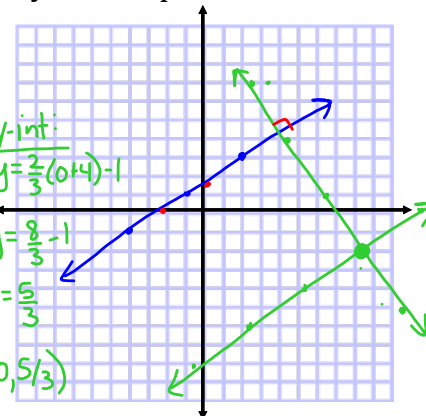
$$\frac{3}{2} = x + 4$$

$$x = -4 + \frac{3}{2} = -2.5, 0$$

$$y = \frac{8}{3} - 1$$

$$y = \frac{5}{3}$$

$$(0, 5/3)$$



Write the equation of the lines that are parallel and perpendicular to the above equation that goes through the point $(8, -2)$. Graph the 2 lines.

$$y = a(x-h) + k$$

$$\text{parallel } y = \frac{2}{3}(x-8) - 2$$

$$\text{perpendicular } y = -\frac{3}{2}(x-8) - 2$$

