

Algebra 1 3.3

Use rate of change to solve problems

\*8th grade standard

Find the slope of a line\*

rate of change

slope

positive slope

negative slope

zero slope

undefined slope

constant

linear

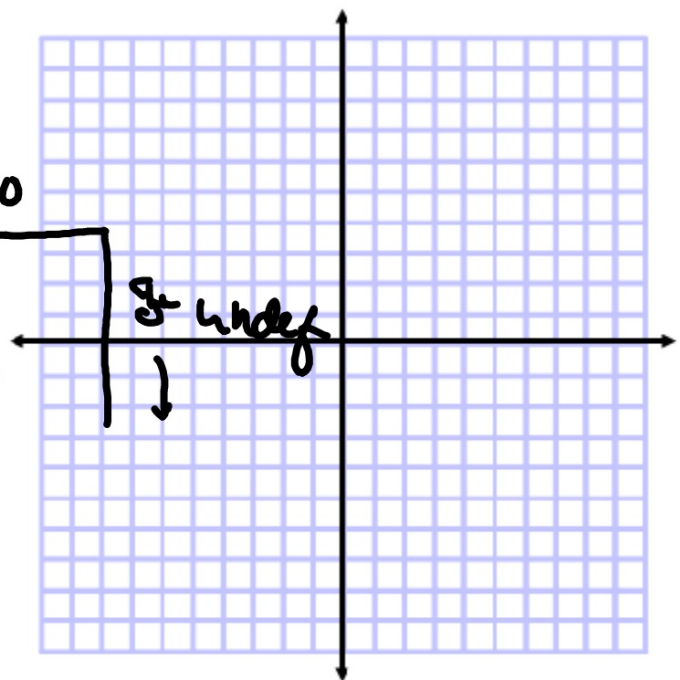
whiteboards

slope song

r.o.c.  
 $m$

+ - 0

always same  
 $y = 3$



**1 Rate of Change** **Rate of change** is a ratio that describes, on average, how much one quantity changes with respect to a change in another quantity.

**KeyConcept** Rate of Change

If  $x$  is the independent variable and  $y$  is the dependent variable, then

$$\text{rate of change} = \frac{\text{change in } y}{\text{change in } x}.$$

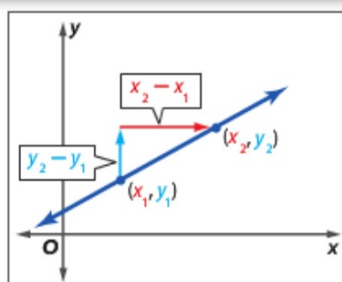
## KeyConcept Slope

**Words** The slope of a nonvertical line is the ratio of the rise to the run.

**Symbols** The slope  $m$  of a nonvertical line through any two points,  $(x_1, y_1)$  and  $(x_2, y_2)$ , can be found as follows.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \begin{array}{l} \leftarrow \text{change in } y \\ \leftarrow \text{change in } x \end{array}$$

**Graph**



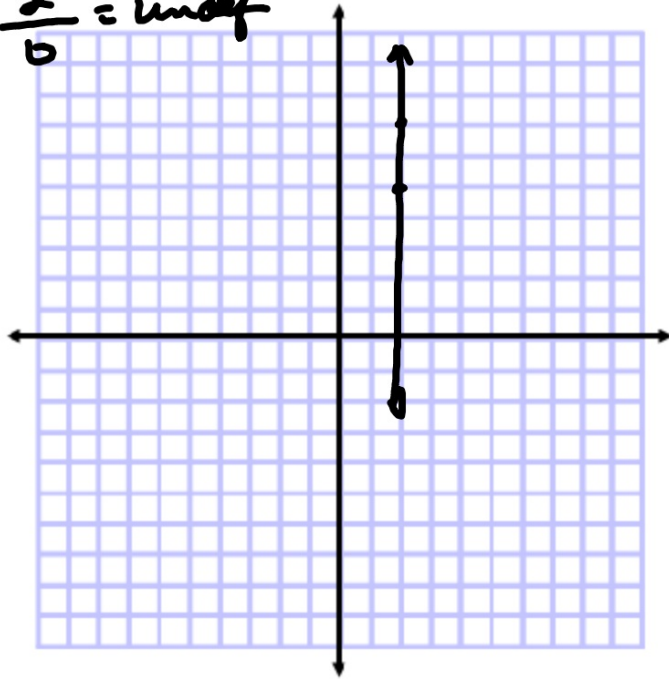
c.  $(-3, -1)$  and  $(2, -1)$

$$m = 0 = \frac{0}{5}$$

$(2, 5)$

$(2, 7)$

$$\frac{2}{0} = \text{undef}$$



• **Guided**Practice

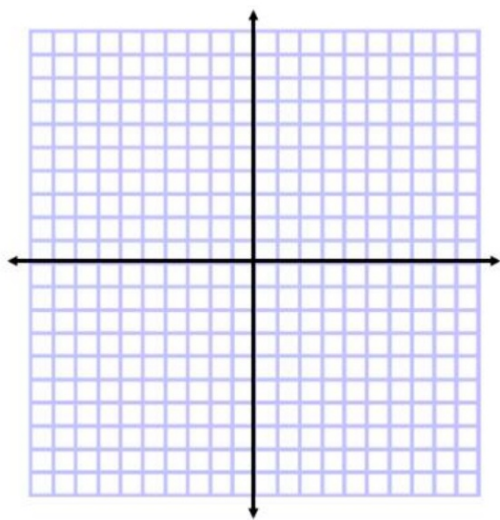
Find the slope of the line that passes through each pair of points.

4A.  $(3, 6), (4, 8)$

4B.  $(-4, -2), (0, -2)$

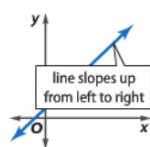
4C.  $(-4, 2), (-2, 10)$

$$m = \frac{6}{3} = \frac{2}{1} = 2$$



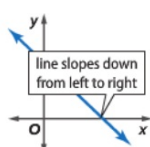
## ConceptSummary Slope

positive slope



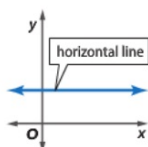
The function values are increasing over the entire domain.

negative slope



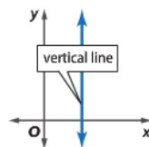
The function values are decreasing over the entire domain.

slope of 0



The function values are constant over the entire domain.

undefined slope



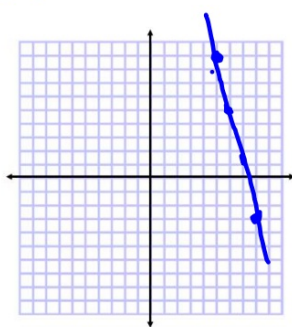
The relation is not a function.

Find the value of  $r$  so the line that passes through each pair of points has the given slope.

20.  $(r, 3), (5, 9), m = \frac{2}{1}$   $m = \frac{y - y_1}{x - x_1}$

$r = 2$

$\frac{3 - 9}{r - 5} = \frac{2}{1}$   
 $(2, 3) (5, 9)$   
 " )



$\frac{-6}{(r-5)} = \frac{2}{1}$

$2(r-5) = -6$

$2r - 10 = -6$   
 $+10 \quad +10$

$2r = 4 \quad r = 2$

21.  $(5, 9), (8, -3), m = -\frac{4}{1}$

$\frac{12}{5-r} = -\frac{4}{1}$

$12 = -4(5-r)$

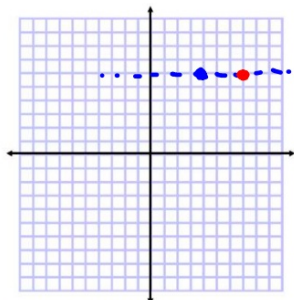
$12 = -20 + 4r$   
 $+20 \quad +20$

$32 = 4r$   
 $\frac{32}{4} = \frac{4r}{4}$

$8 = r$

24.  $(5, 3), (r, -5), m = 4$

$$\frac{(\quad)}{(\quad)} = \text{undef}$$



25.  $(7, r), (4, 6), m = 0$

$\uparrow$   
6

$$\frac{r-6}{7-4} = 0$$

$$\frac{r-6}{3} = \frac{0}{1}$$

$$1(r-6) = 0$$

$$r-6 = 0$$

$$r = 6$$

$$\begin{array}{l} \overset{x}{(2012, \overset{y}{6,000,000})} \\ (2020, 8,000,000) \end{array} \quad m = \text{rise} \quad \frac{y-y}{x-x}$$

$$m = r.o.c = ? \quad \frac{2,000,000}{8} = 250,000 \frac{\text{people}}{\text{yr}}$$

$$m = \frac{2}{3}$$

$$\frac{10}{3}$$

