

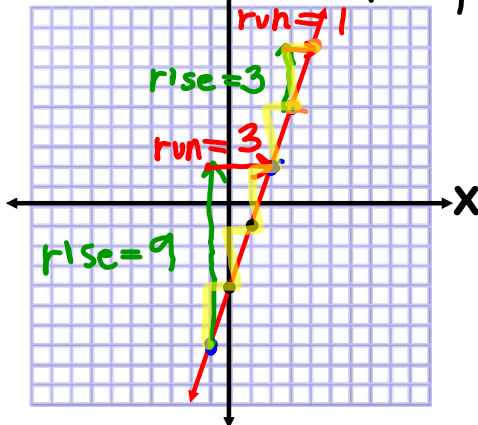
# 3.4 SLOPE & RATE OF CHANGE

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

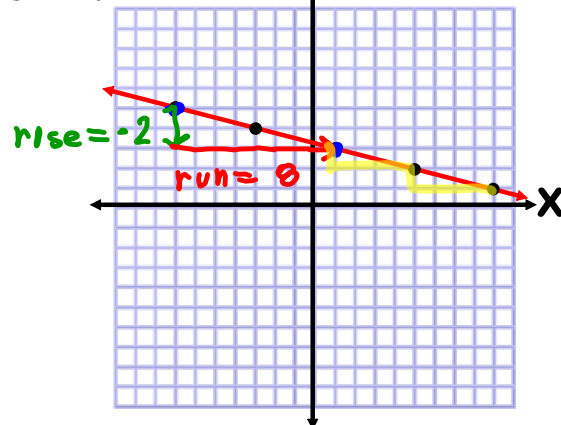
↑ positive ↓ negative  
→ positive ← negative

Find the slope of the following lines.

1.  $\text{slope} = \frac{3}{1} = 3$  2.

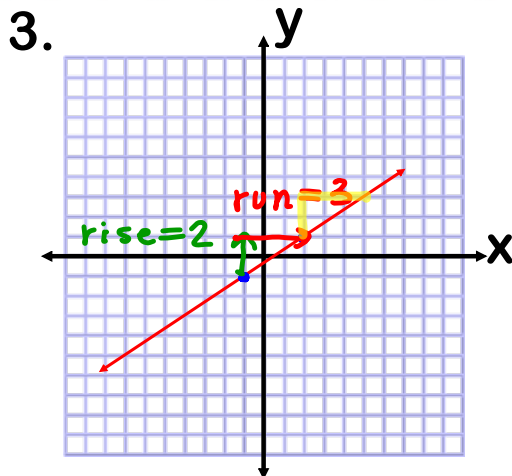


$$\text{slope} = \frac{9}{3} = 3$$

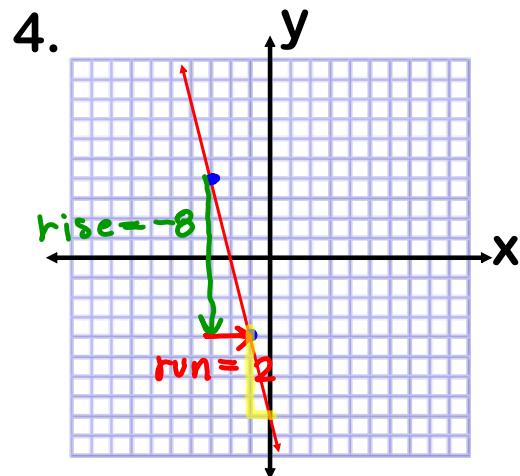


$$\text{slope} = \frac{-2}{8} = -\frac{1}{4}$$

Find the slope of the following lines.



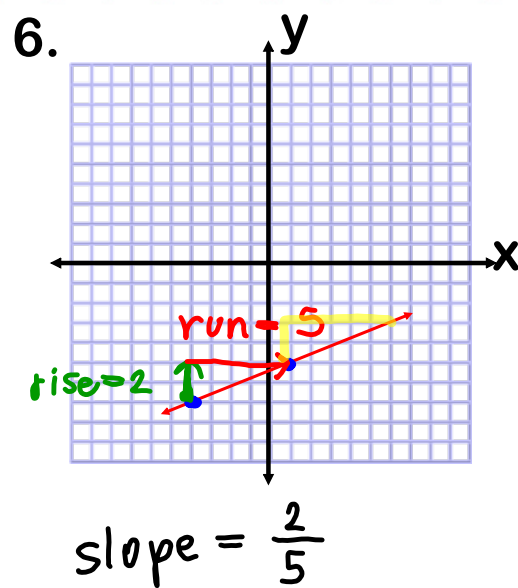
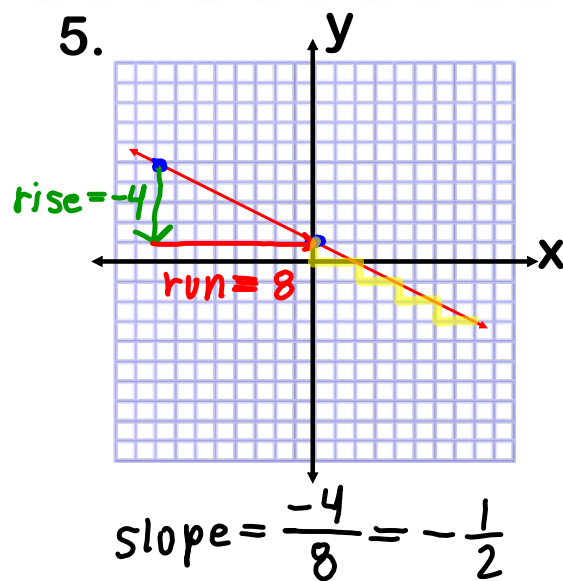
$$\text{slope} = \frac{2}{3}$$



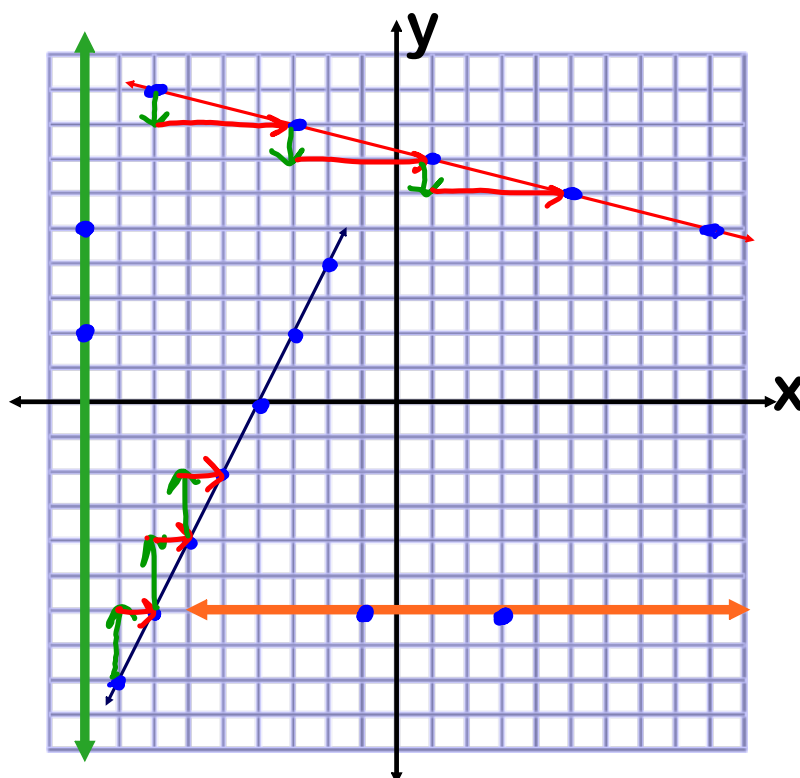
$$\text{slope} = \frac{-8}{2} = -4$$

$$\frac{-4}{1}$$

Find the slope of the following lines.



7. Find the slopes of each line.



red line

$$= \frac{1}{4}$$

green line

$$\frac{3}{0} \text{ vertical}$$

undefined

blue line

$$\frac{2}{1} = 2$$

orange line

$$\frac{0}{4} = 0 \text{ horizontal}$$

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x}$$

8. Determine the slope of the line containing the points with the coordinates listed in the tables below.

a)

x	-2	0	2	4	6	$\Delta x = 2$
y	-3	0	3	6	9	$\Delta y = 3$

Handwritten annotations: Red arrows above the x-values show a constant increase of +2. Green arrows below the y-values show a constant increase of +3.

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{3}{2}$$

b)

x	-4	-1	2	5	8	$\Delta x = 3$
y	-3	-2	-1	0	1	$\Delta y = 1$

Handwritten annotations: Red arrows above the x-values show a constant increase of +3. Green arrows below the y-values show a constant increase of +1.

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{1}{3}$$

The slope  $m$  of a line that passes through the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is

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

9. Find the slope of the line that passes through the points  $(1, 0)$  and  $(3, 4)$ .
- Handwritten annotations: "point 1" above  $(1, 0)$  with  $x_1, y_1$  below; "point 2" above  $(3, 4)$  with  $x_2, y_2$  below.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{3 - 1} = \frac{4}{2} \rightarrow \boxed{m = 2}$$

10. Find the slope of the line that passes through the points  $(1, 2)$  and  $(5, 2)$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 2}{5 - 1} = \frac{0}{4} \rightarrow \boxed{m = 0}$$

11. Find the slope of the line that passes through the points  $(5, -1)$  and  $(5, 3)$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-1)}{5 - 5} = \frac{4}{0} \rightarrow \boxed{m = \text{undefined}}$$

12. Find the slope of the line that passes through the points  $(-2, 1)$  and  $(1, -3)$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 1}{1 - (-2)} = \boxed{\frac{-4}{3} = m}$$

13. Find the slope of the line that passes through the points  $(\frac{3}{4}, \frac{3}{4})$  and  $(\frac{3}{8}, \frac{1}{2})$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\frac{1}{2} - \frac{3}{4}}{\frac{3}{8} - \frac{3}{4}} = \frac{-\frac{1}{4}}{-\frac{3}{8}} \rightarrow \boxed{m = \frac{2}{3}}$$