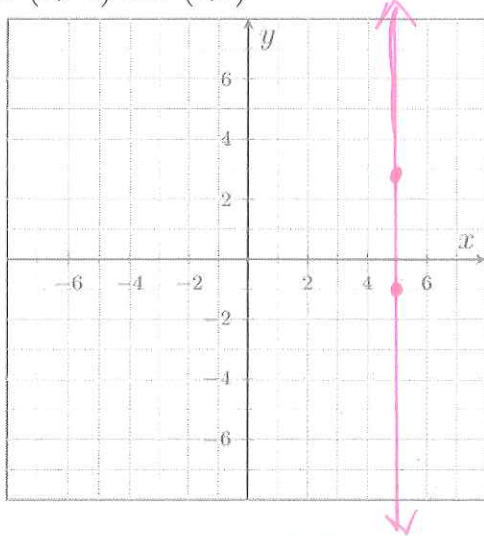


Section 4.8 Horizontal, Vertical, Parallel and Perpendicular Lines

1. Graph and find the slope of the line between each pair of points. Then write the equation of each line.

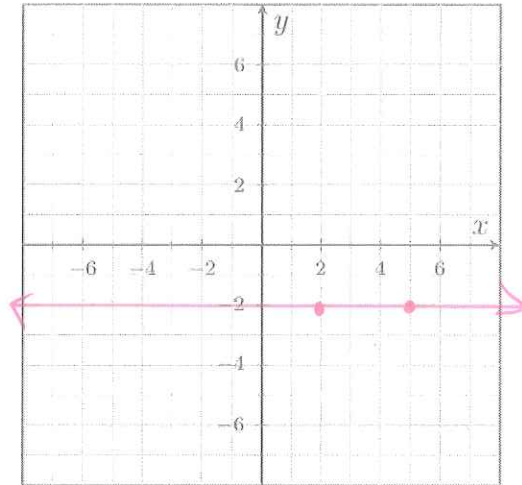
a. $(5, -1)$ and $(5, 3)$



Slope: *undefined*

Equation: $x = 5$

b. $(2, -2)$ and $(5, -2)$

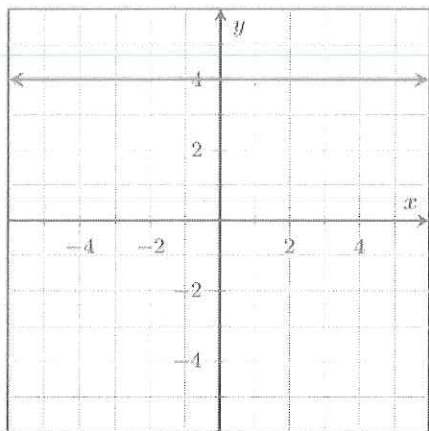


Slope: $m = 0$

Equation: $y = -2$

2. Write the equation of each line. Then identify the slope, y-intercept and x-intercept.

a.



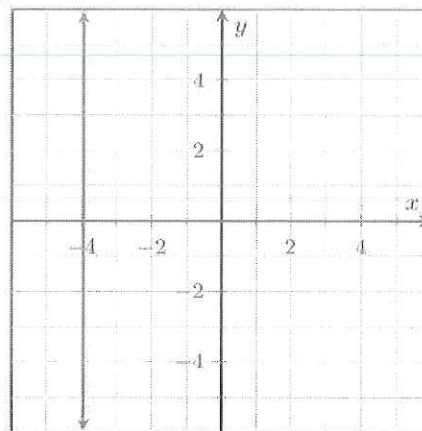
Equation: $y = 4$

Slope: 0

x-intercept: *none*

y-intercept: $(0, 4)$

b.



Equation: $x = -4$

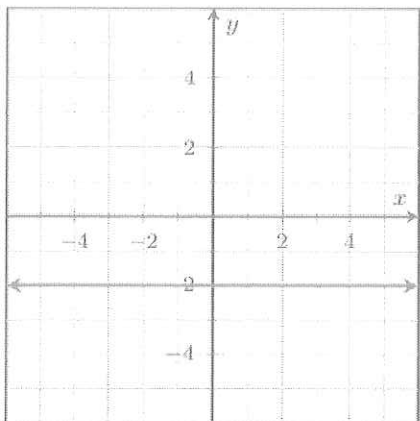
Slope: *undefined*

x-intercept: $(-4, 0)$

y-intercept: *none*

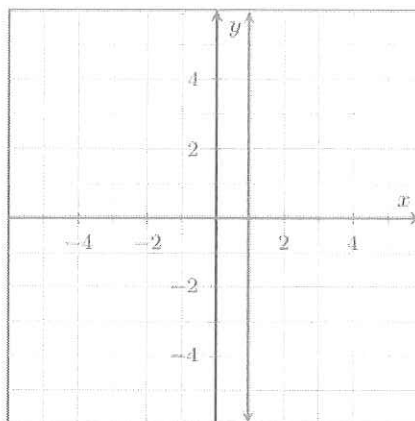
3. Write the equation of each line. Then identify the slope, y-intercept and x-intercept.

a.



Equation: $y = -2$
 Slope: 0
 x-intercept: *none*
 y-intercept: $(0, -2)$

b.

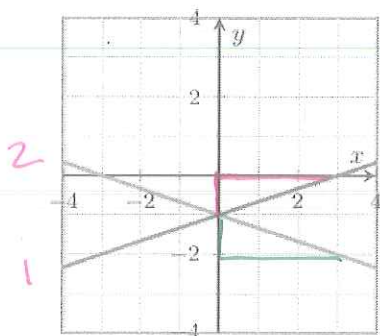


Equation: $x = 1$
 Slope: *undefined*
 x-intercept: $(1, 0)$
 y-intercept: *none*

Parallel and Perpendicular Lines

4. Determine whether the lines are parallel, perpendicular or neither. Then write the slope of each line.

a.



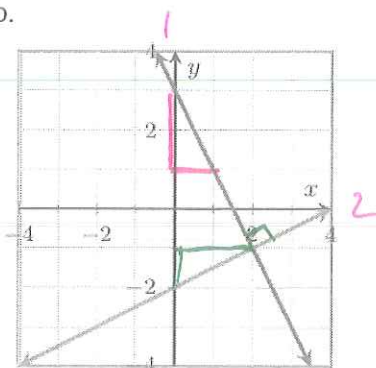
Slope of line 1: $\frac{1}{3}$

Slope of line 2: $-\frac{1}{3}$
neither

Parallel lines have the same slope.

The slopes of perpendicular lines are opposite reciprocals.

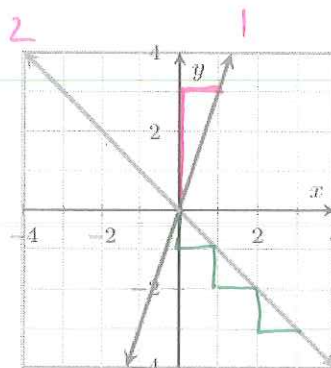
b.



Slope of line 1: $-\frac{2}{1}$

Slope of line 2: $\frac{1}{2}$
perpendicular

c.



Slope of line 1: $\frac{3}{1}$ or 3

Slope of line 2: $-\frac{1}{1}$ or -1
neither

5. Determine whether each pair of lines is parallel, perpendicular or neither.

a. $y = 3x + 4$ and $y = -\frac{1}{3}x - 9$

perpendicular

b. $y = -\frac{2}{3}x + 7$ and $y = -3x - 1$

neither

c. $x = 3$ and $y = -1$



perpendicular

d. $2x + y = 4$ and $6x + 3y = 7$

Solve for y

$y = -2x + 4$

$\frac{3y}{3} = \frac{-6x + 7}{3}$

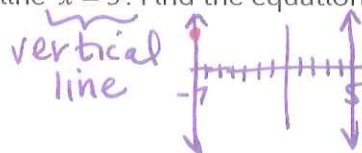
parallel

$y = -2x + \frac{7}{3}$

e. $x = 3$ and $x = 7$
parallel

Writing the equation of a line given a parallel or perpendicular line

6. A line passes through the point $(-7, 8)$ and is parallel to the line $x = 5$. Find the equation of the line.



$x = -7$

7. Line k has the equation $y = 2x + 5$. Line l is perpendicular to line k, but it goes through the point $(4, 6)$. Find an equation for line l in point-slope and slope-intercept form.

line k: $y = 2x + 5$

$m = 2$

perpendicular

line l: $m = -\frac{1}{2}$

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

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

point-slope

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

$y = -\frac{1}{2}x + 8$

slope-intercept

8. Line m passes through the points $(4, 7)$ and $(-10, 7)$. Line n passes through the points $(6, 2)$ and $(-10, 2)$. Determine how the two lines are related. Are they parallel, perpendicular or neither?

line m: $\frac{7-7}{-10-4} = \frac{0}{-14} = 0$

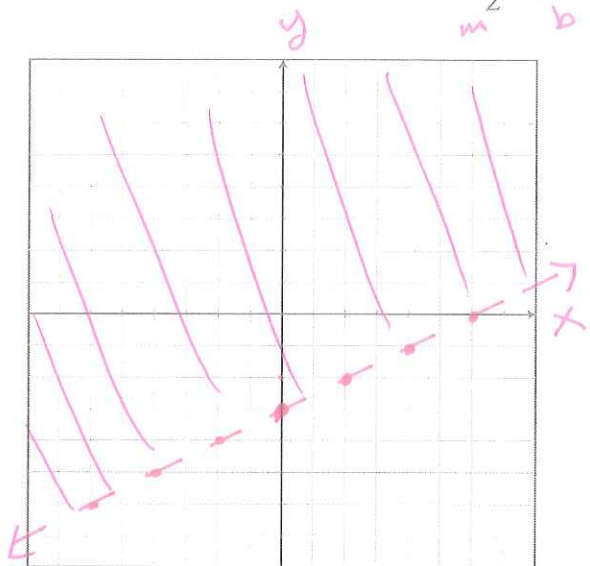
These lines are parallel.
(both horizontal)

line n: $\frac{2-2}{-10-6} = \frac{0}{-16} = 0$

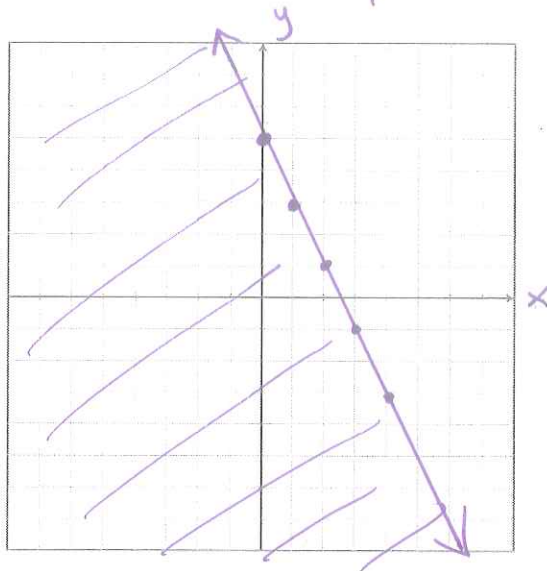
\geq above \leq below
 $>$ above $<$ below

Section 4.10 Linear Inequalities in Two Variables

9. a. Graph the linear inequality $y > \frac{1}{2}x - 3$.

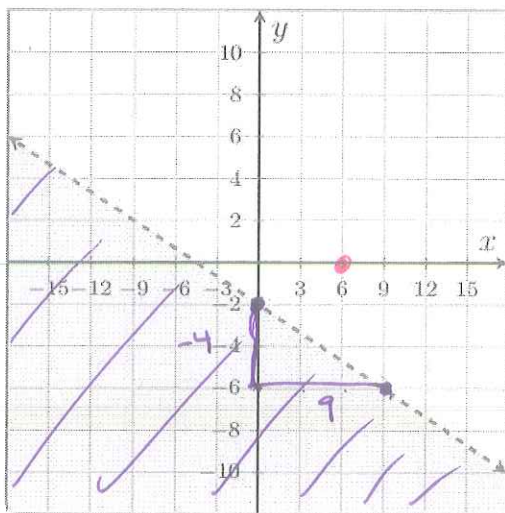


b. Graph the inequality $y \leq -2x + 5$.



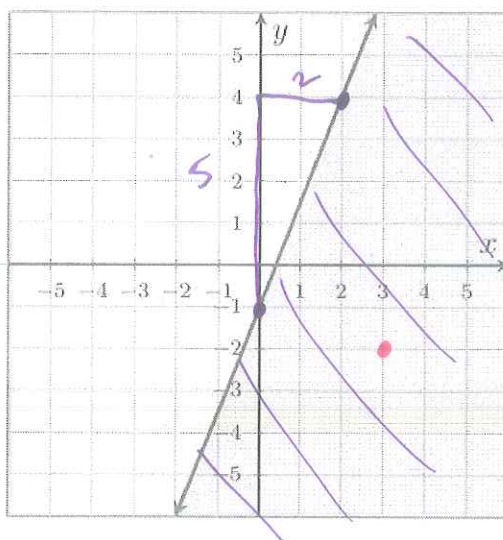
10. Find and state an inequality whose solution set would be the graph shown.

a.



$$y < -\frac{4}{9}x - 2$$

b.



$$y \leq \frac{5}{2}x - 1$$

11. a. Is the point $(6, 0)$ a solution to the inequality graphed in 10a above? How could you prove this algebraically?

$$0 < -\frac{4}{9}(6) - 2$$

$$0 < -\frac{24}{9} - 2$$

$$0 < -\frac{24}{9} - \frac{2 \cdot 9}{9}$$

$$0 < -\frac{24}{9} - \frac{18}{9}$$

$$0 \not< -\frac{14}{3}$$

$(6, 0)$ is not a solution.

b. Is the point $(3, -2)$ a solution of the inequality graphed in 10b above? Prove this algebraically.

$$-2 \leq \frac{5}{2} \cdot 3 - 1$$

$$-2 \leq \frac{13}{2}$$

true

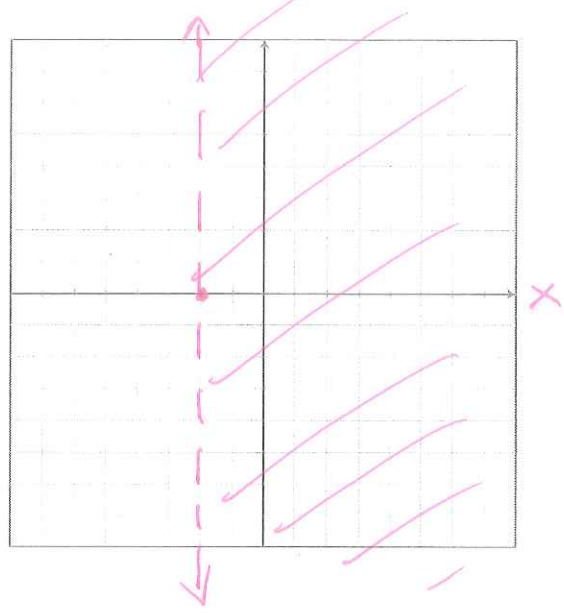
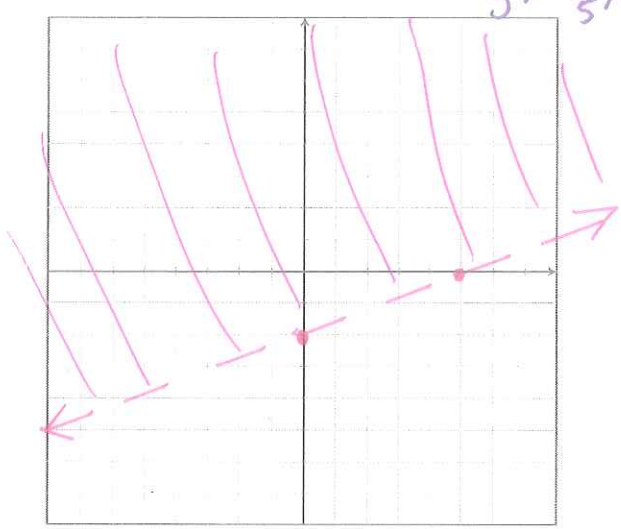
$(3, -2)$ is a solution

$x = -2$ vertical line

Solve for y

12. a. Graph the linear inequality $2x - 5y < 10$.

b. Graph the inequality $x > -2$

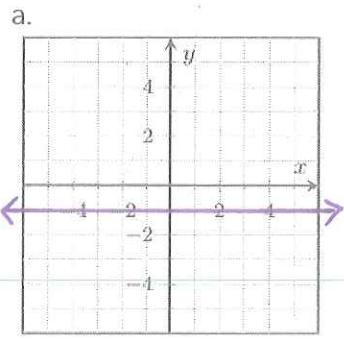


$2x - 5y < 10$
 $-2x$ $-2x$

More Practice

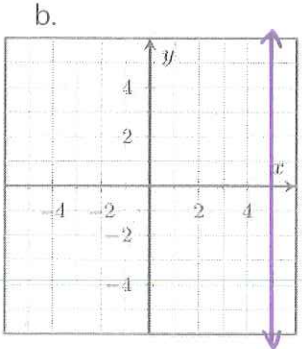
$-\frac{5y}{5} < \frac{-2x+10}{5} \frac{1}{5}$ $y > \frac{2}{5}x - 2$

13. For parts a and b, graph each line and determine its slope. For parts c and d, state the equation of the line and its slope.



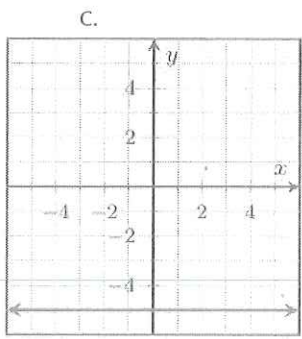
Equation: $y = -1$

Slope: $m = 0$



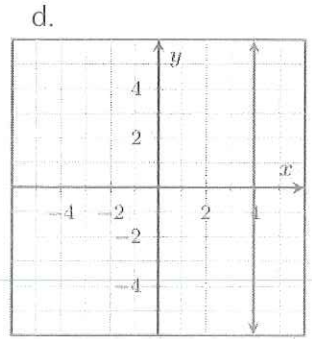
Equation: $x = 5$

Slope: *undefined*



Equation: $y = -5$

Slope: $m = 0$



Equation: $x = 4$

Slope: *undefined*

14. Determine whether each pair of lines is parallel, perpendicular or neither.

a. $y = 7x + 1$ and $y = x - 7$

$m = 7, m = 1$

neither

b. $y = 8x + 1$ and $y = -\frac{1}{8}x + 3$

$m = 8, m = -\frac{1}{8}$

perpendicular

c. $x = -5$ and $x = 4$

vertical lines
parallel

Solve for y:
d. $3x + y = 4$ and $6x + 2y = 7$
 $-3x \quad -3x \quad -6x \quad -6x$

$y = -3x + 4$

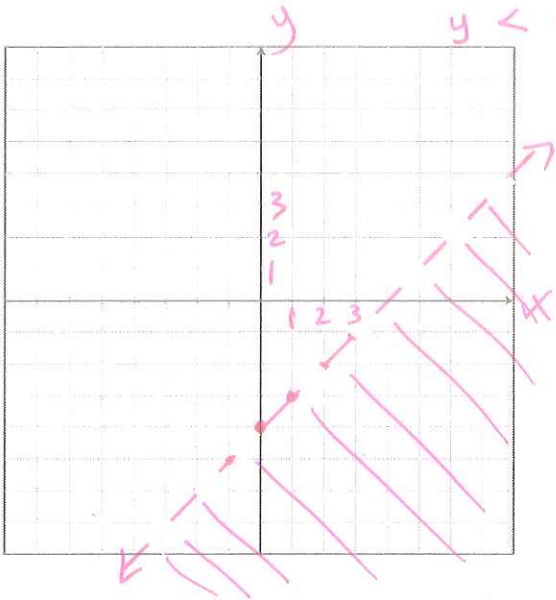
$\frac{2y}{2} = \frac{-6x + 7}{2}$

$y = -3x + \frac{7}{2}$

parallel lines

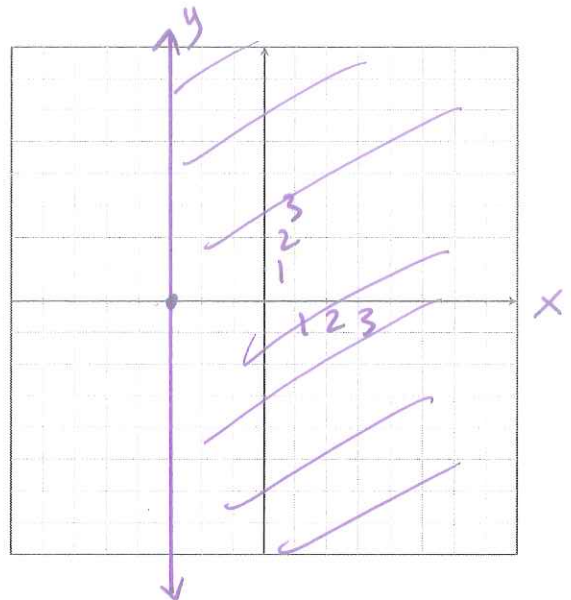
15. a. Graph the linear inequality $x - y > 4$.

$-x \quad -x$
 $\frac{-y}{-1} > \frac{-x + 4}{-1}$
 $y < x - 4$



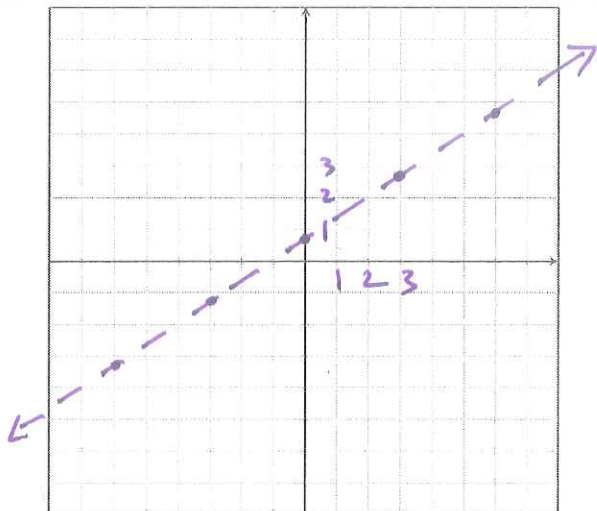
b. Graph the inequality $x \geq -3$

vertical line



16. a. Graph the linear inequality $2x - 3y < -2$.

$-2x \quad -2x$
 $\frac{-3y}{-3} < \frac{-2x - 2}{-3}$
 $y > \frac{2}{3}x + \frac{2}{3}$



b. Graph the inequality $y > 4$

horizontal line

