NAME Key DATE PERIOD

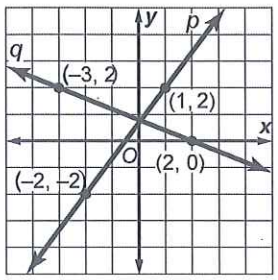
3-3 Study Guide and Intervention

Key Idea

Slopes of Lines

Slope of a Line The slope m of a line containing two points with coordinates (x_1, y_1) and (x_2, y_2) is given by the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where $x_1 \neq x_2$.

Example **Find the slope of each line.**



For line p, substitute (1, 2) for (x_1, y_1) and (–2, –2) for (x_2, y_2).

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

For line q, substitute (2, 0) for (x_1, y_1) and (–3, 2) for (x_2, y_2).

$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-0}{-3-2} = \frac{2}{-5}$$

Exercises

Determine the slope of the line that contains the given points.

1. $J(0, 0)$, $K(-2, 8)$

$m = \frac{8-0}{-2-0} = \boxed{-4}$

2. $R(-2, -3)$, $S(3, -5)$

$m = \frac{-5+3}{3+2} = \boxed{-\frac{2}{5}}$

3. $L(1, -2)$, $N(-6, 3)$

$m = \frac{3+2}{-6-1} = \boxed{-\frac{5}{7}}$

4. $P(-1, 2)$, $Q(-9, 6)$

$m = \frac{6-2}{-9+1} = \boxed{-\frac{1}{2}}$

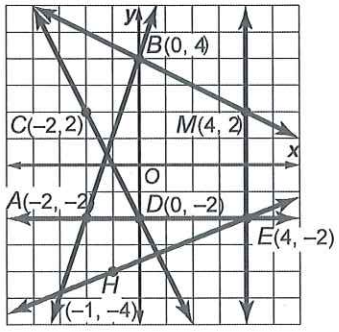
5. $T(1, -2)$, $U(6, -2)$

$m = \frac{-2+2}{6-1} = \boxed{0}$

6. $V(-2, 10)$, $W(-4, -3)$

$m = \frac{10+3}{-2+4} = \boxed{\frac{7}{2}}$

Find the slope of each line.



7. $\overline{AB}$ A(–2, –2), B(0, 4)

$m = \frac{4+2}{0+2} = \boxed{3}$

8. $\overline{CD}$ C(–2, 2), D(0, –2)

$m = \frac{2+2}{-2-0} = \boxed{-2}$

9. $\overline{EM}$ E(4, –2), M(4, 2)

$m = \frac{-2-2}{4-4} = \frac{-4}{0}$ undefined

10. $\overline{AE}$ A(–2, –2), E(4, –2)

$m = \frac{-2+2}{-2-4} = \boxed{0}$

11. $\overline{EH}$ E(4, –2), H(–1, –4)

$m = \frac{-2+4}{4+1} = \boxed{\frac{2}{5}}$

12. $\overline{BM}$ B(0, 4), M(4, 2)

$m = \frac{4-2}{0-4} = \boxed{-\frac{1}{2}}$

Lesson 3-3

NAME Key DATE PERIOD

MUST DO ODDS

EVENS EXTRA Credit.

3-3 Study Guide and Intervention *(continued)*

(Key Ideas)

Slopes of Lines

Parallel and Perpendicular Lines If you examine the slopes of pairs of parallel lines and the slopes of pairs of perpendicular lines, where neither line in each pair is vertical, you will discover the following properties.

Two lines have the same slope if and only if they are parallel.

Two lines are perpendicular if and only if the product of their slopes is –1. ex $\frac{2}{3} \times -\frac{3}{2} = -1$

Example **Determine whether $\overline{AB}$ and $\overline{CD}$ are *parallel*, *perpendicular*, or *neither* for $A(-1, -1)$, $B(1, 5)$, $C(1, 2)$, $D(5, 4)$. Graph each line to verify your answer.**

- Parallel: same slope
- Perpendicular: slopes are opposite reciprocals ex $\frac{2}{3}, -\frac{3}{2}$
- write neither if not same or opp. recip.

(1) Find the slope of each line.

slope of $\overline{AB} = \frac{5-(-1)}{1-(-1)} = \frac{6}{2}$ or

slope of $\overline{CD} = \frac{4-2}{5-1} = \frac{2}{4} = \frac{1}{2}$

The two lines do not have the same slope, so they are *not* parallel.

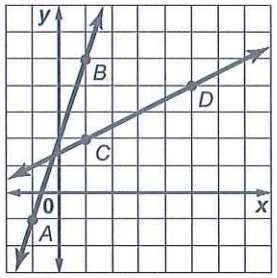
To determine if the lines are perpendicular, find the product of their slopes

$3\left(\frac{1}{2}\right) = \frac{3}{2}$ or Product of slope for $\overline{AB}$ and $\overline{CD}$.

Since the product of their slopes is *not* –1, the two lines are *not* perpendicular.

$\overline{AB}$ and $\overline{MNCD}$

When graphed, the two lines intersect but not at a right angle.



Exercises

Determine whether $\overline{MN}$ and $\overline{RS}$ are *parallel*, *perpendicular*, or *neither*. Graph each line to verify your answer. Graph Paper Available on counter.

1. $M(0, 3)$, $N(2, 4)$, $R(2, 1)$, $S(8, 4)$
   $m = \frac{4-3}{2-0} = \frac{1}{2}$ | $m = \frac{4-1}{8-2} = \frac{1}{2}$ parallel

2. $M(-1, 3)$, $N(0, 5)$, $R(2, 1)$, $S(6, -1)$
   $m = \frac{5-3}{0+1} = 2$ | $m = \frac{-1-1}{6-2} = -\frac{1}{2}$ perpendicular

3. $M(-1, 3)$, $N(4, 4)$, $R(3, 1)$, $S(-2, 2)$
   $m = \frac{4-3}{4+1} = \frac{1}{5}$ | $m = \frac{2-1}{-2-3} = -\frac{1}{5}$ neither

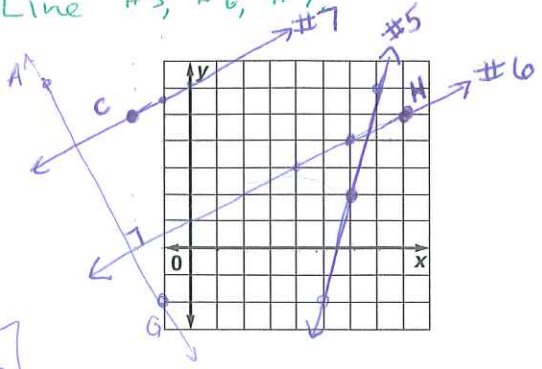
4. $M(0, -3)$, $N(-2, -7)$, $R(2, 1)$, $S(0, -3)$
   $m = \frac{-7+3}{-2-0} = 2$ | $m = \frac{-3-1}{0-2} = 2$ parallel

Graph the line that satisfies each condition. Label each Line #5, #6, #7

5. slope = 4, passes through (6, 2)

6. passes through $H(8, 5)$, perpendicular to $\overline{AG}$ with $A(-5, 6)$ and $G(-1, -2)$
   Slope of $\overline{AG} = \frac{6+2}{-5+1} = -2 \rightarrow \frac{1}{2}$ slope

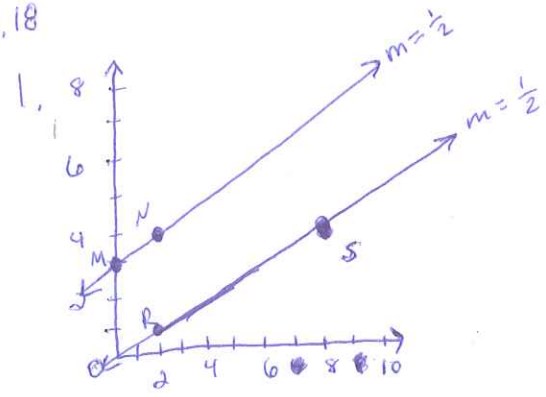
7. passes through $C(-2, 5)$, parallel to L B with $L(2, 1)$ and $B(7, 4)$
   Slope of $\overline{LB} = \frac{4-1}{7-2} = \frac{3}{5} \rightarrow \frac{3}{5}$ slope

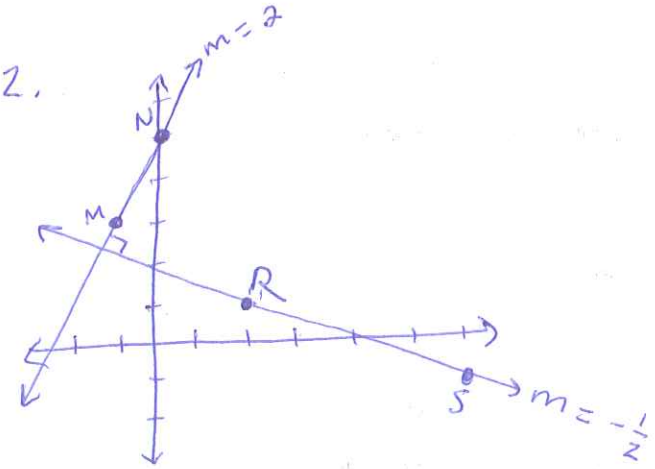


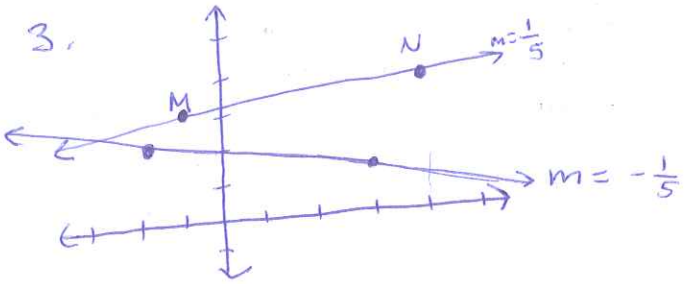
3-3 GRAPHS

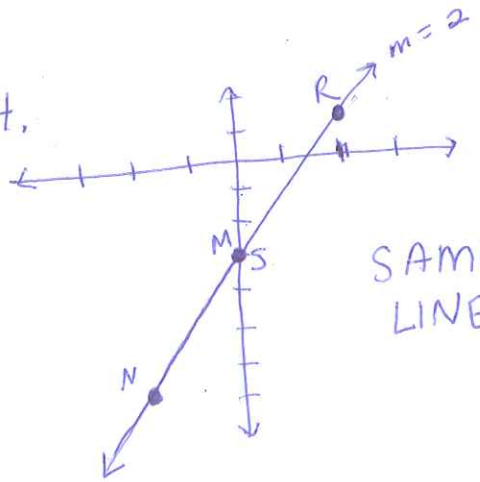
Key

p. 18

1. 

2. 

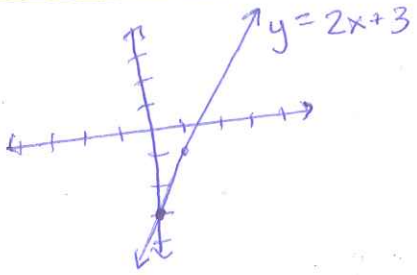
3. 

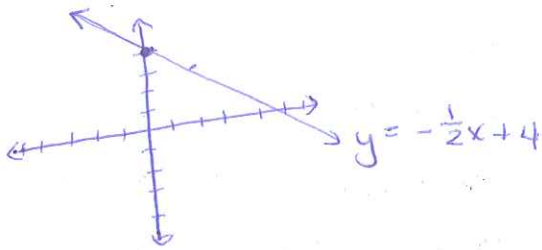
4. 

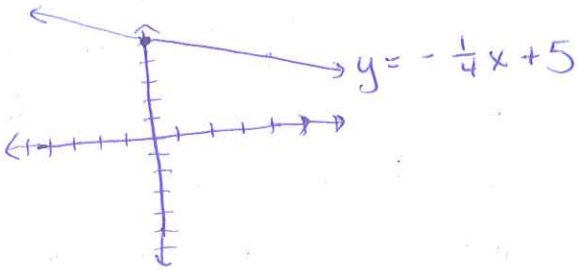
SAME LINE

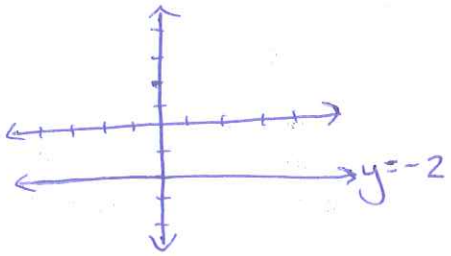
3-4 GRAPHS

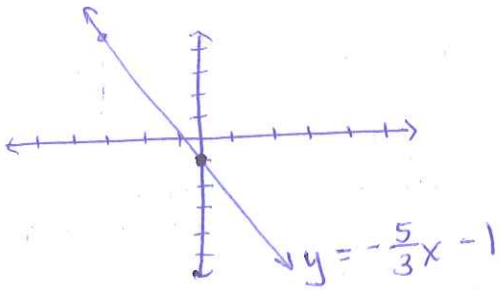
p. 24

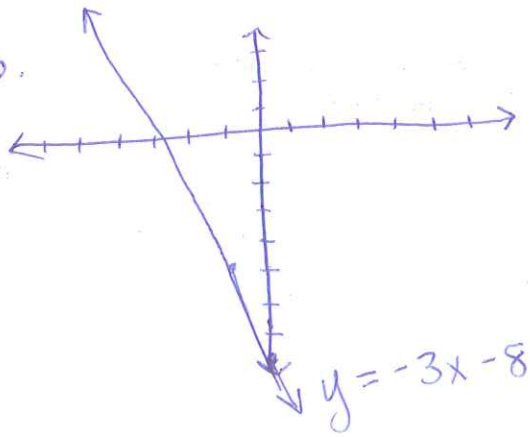
1. 

2. 

3. 

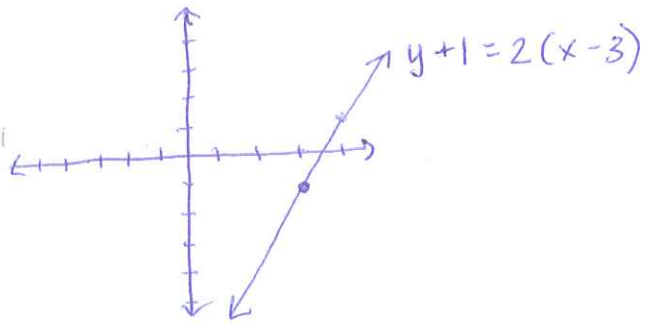
4. 

5. 

6. 

3-4 GRAPH p. 24 Key

7.



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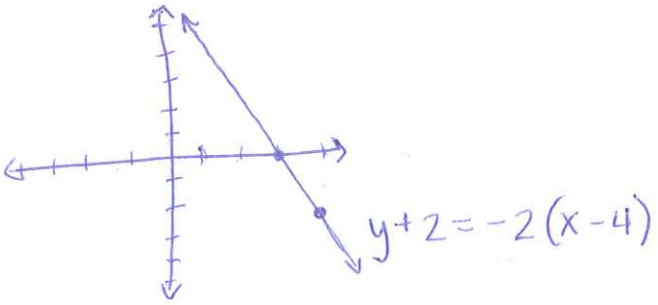

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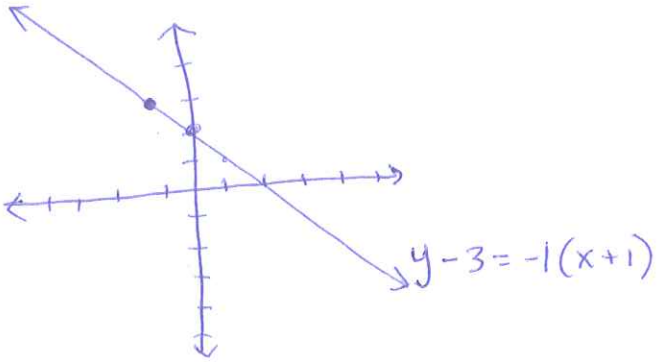

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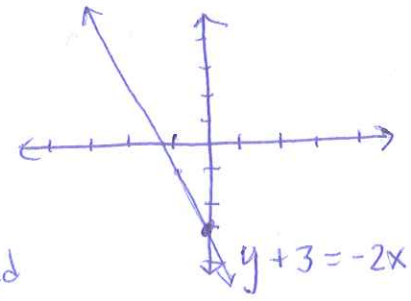
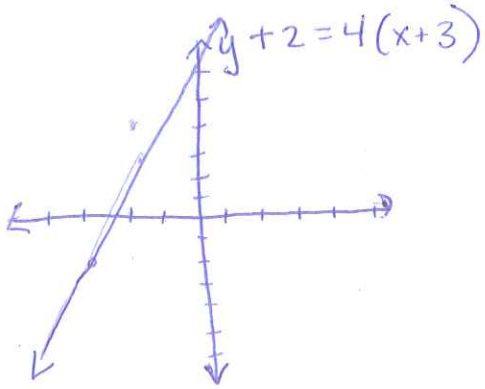


notice, these are switched

11.



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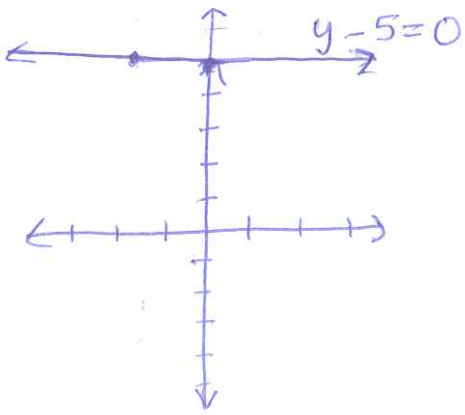

NAME Key DATE PERIOD

MUST DO ODDS
Evens Extra Credit.

3-4 Study Guide and Intervention

Key Ideas

Equations of Lines

Write Equations of Lines You can write an equation of a line if you are given any of the following:

- the slope and the y-intercept,
- the slope and the coordinates of a point on the line, or
- the coordinates of two points on the line.

If m is the slope of a line, b is its y-intercept, and (x_1, y_1) is a point on the line, then:

- the **slope-intercept form** of the equation is $y = mx + b$,
- the **point-slope form** of the equation is $y - y_1 = m(x - x_1)$.

Example 1 **Write an equation in slope-intercept form of the line with slope –2 and y-intercept 4.**

$y = mx + b$ Slope-intercept form

$y = -2x + 4$ $m = -2$, $b = 4$

The slope-intercept form of the equation of the line is $y = -2x + 4$.

Example 2 **Write an equation in point-slope form of the line with slope $-\frac{3}{4}$ that contains (8, 1).**

$y - y_1 = m(x - x_1)$ Point-slope form

$y - 1 = -\frac{3}{4}(x - 8)$

The point-slope form of the equation of the line is $y - 1 = -\frac{3}{4}(x - 8)$.

Exercises

Write an equation in slope-intercept form of the line having the given slope and y-intercept or given points. Then graph the line. Graph Paper on Counter.

1. m: 2, b: –3

$y = 2x - 3$

2. m: $-\frac{1}{2}$, b: 4

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

3. m: $-\frac{1}{4}$, b: 5

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

4. m: 0, b: –2

$y = -2$

5. m: $-\frac{5}{3}$, (0, –1)

$y = -\frac{5}{3}x + b \rightarrow -1 = -\frac{5}{3}(0) + b$

$-1 = b \rightarrow y = -\frac{5}{3}x - 1$

6. m: –3, (1,–11)

$y = -3x + b$

$-11 = -3(1) + b$

$+3 \quad +3$

$-8 = b$

$y = -3x - 8$

Write an equation in point-slope form of the line having the given slope that contains the given point. Then graph the line. Graph Paper on Counter

7. $m = \frac{2}{1}$, (3, –1)

$y + 1 = 2(x - 3)$

8. m = –2, (4, –2)

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

9. m = –1, (–1, 3)

$y - 3 = -1(x + 1)$

10. $m = \frac{4}{1}$, (–3, –2)

$y + 2 = 4(x + 3)$

11. $m = -\frac{2}{1}$, (0, –3)

$y + 3 = -2x$

12. m = 0, (–2, 5)

$y - 5 = 0$

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3-4 Study Guide and Intervention *(continued)*

Equations of Lines

Write Equations to Solve Problems Many real-world situations can be modeled using linear equations.

Example **Donna offers computer services to small companies in her city. She charges $55 per month for maintaining a web site and $45 per hour for each service call.** fixed monthly cost (y int) cost per hour is slope

a. Write an equation to represent the total monthly cost, C, for maintaining a web site and for h hours of service calls.

For each hour, the cost increases $45. So the rate of change, or slope, is 45. The y-intercept is located where there are 0 hours, or $55.

$C = mh + b$

$= 45h + 55$

b. Donna may change her costs to represent them by the equation $C = 25h + 125$, where $125 is the fixed monthly fee for a web site and the cost per hour is $25. Compare her new plan to the old one if a company has $5\frac{1}{2}$ hours of service calls. Under which plan would Donna earn more?

First plan from part a

$C = 45h + 55 = 45\left(5\frac{1}{2}\right) + 55$

$= 247.5 + 55$ or $302.50

Second Plan new from part b

For $5\frac{1}{2}$ hours of service Donna would earn

$C = 25h + 125 = 25(5.5) + 125$

$= 137.5 + 125$ or $262.50

Donna would earn more with the first plan.

Exercises

For Exercises 1–4, use the following information.

Jerri's current satellite television service charges a flat rate of $34.95 per month for the basic channels and an additional $10 per month for each premium channel. A competing satellite television service charges a flat rate of $39.99 per month for the basic channels and an additional $8 per month for each premium channel.

1. Write an equation in slope-intercept form that models the total monthly cost for each satellite service, where p is the number of premium channels.

Jerri's Service: $C = 10p + 34.95$

Competition: $C = 8p + 39.99$

2. If Jerri wants to include three premium channels in her package, which service would be less, her current service or the competing service?

Jerri's: $C = 10(3) + 34.95$

$C = 30 + 34.95$

$C = 64.95$

Comp: $C = 8(3) + 39.99$

$C = 24 + 39.99$

$C = 63.99$ The competing service is cheaper

3. A third satellite company charges a flat rate of $69 for all channels, including the premium channels. If Jerri wants to add a fourth premium channel, which service would be least expensive?

3rd company: $C = 69$ least expensive

Jerri's: $C = 10(4) + 34.95$

$C = 40 + 34.95$

$C = 74.95$

Comp: $C = 8(4) + 39.99$

$C = 32 + 39.99$

$C = 71.99$

4. Write a description of how the fee for the number of premium channels is reflected in the equation.

The fee for the number of premium channels is represented by the product of "p" and the cost per premium channel. Each is shown below:

Jerri's: $10p$ Comp: $8p$ 3rd: none

Lesson 3-4