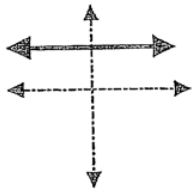
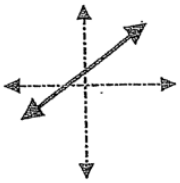
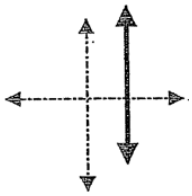
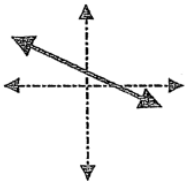
4.1 Slope of a Line

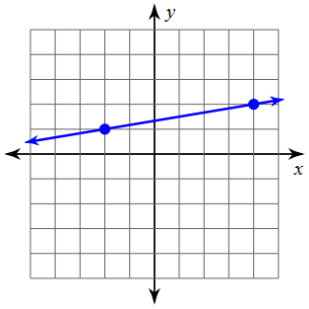
The SLOPE of a line describes how _____

No steepness	Increasing from *left to right*	So steep you're vertical!	Decreasing from *left to right*
			
Slope =	Slope =	Slope =	Slope =

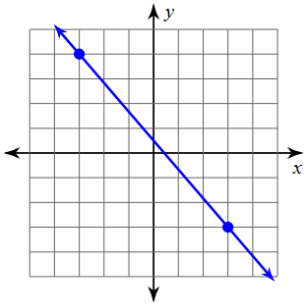
The slope can also be defined as the $\frac{rise}{run}$ to go from one point to another on the line.

Ex.1: Use the points given to determine the slope of each line.

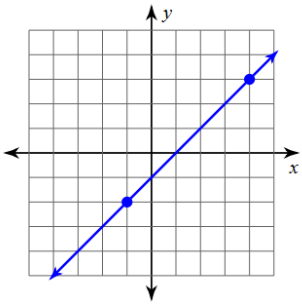
a)



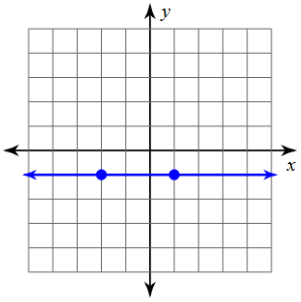
c)



b)



d)



e) What is the slope of a vertical line?

Sometimes you are only given the coordinates of points on a line and asked to determine the slope.

Slope formulas:

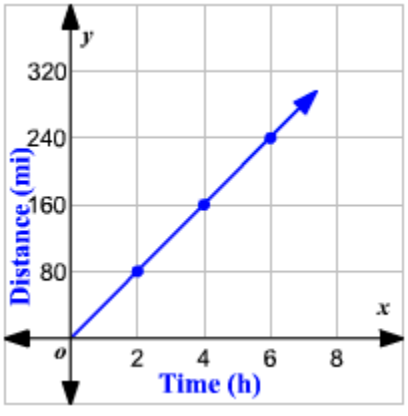
Ex.2: Find the slope of the lines that pass through the following points.

a) $(-5, 4)$ and $(3, -1)$

b) $(4, 5)$ and $(4, -4)$

Ex.3: The slope of a line segment is $\frac{1}{2}$ and passes through the points $(k, 6)$ and $(-1, 2)$.
Find the value of k.

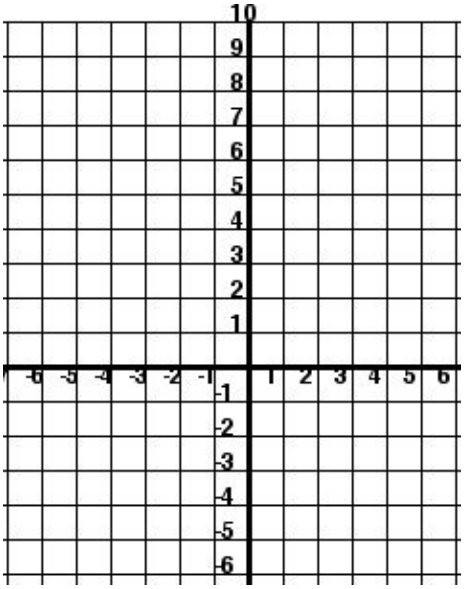
Practical applications of slope:



HW p339 #5-7,9,13a,22

4.2 Slopes of Parallel and Perpendicular Lines

Ex.1: Graph the line segment AB with endpoints A $(-2, 8)$ and B $(-6, -4)$. Graph the line segment CD with endpoints C $(5, 4)$ and D $(2, -5)$. Find the slopes of both lines. What conclusion can you make about the two lines?



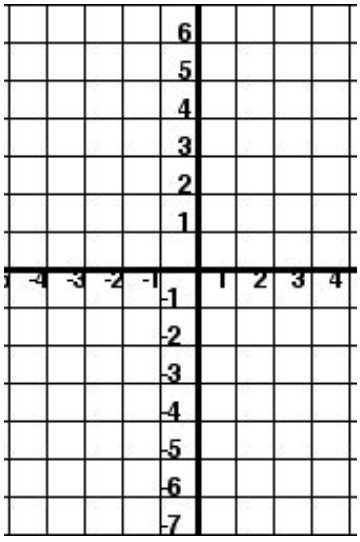
Parallel Lines

Parallel lines are lines that never cross.

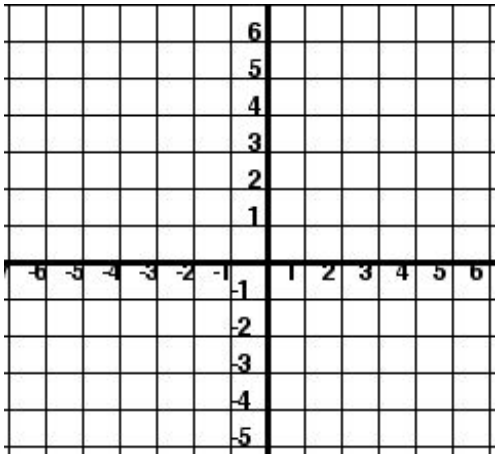
Lines & line segments are parallel if they have the _____

Ex. 2: Determine whether the quadrilateral (4-sided figure) with vertices A $(0, -6)$, B $(2, -1)$, C $(-1, 5)$ and D $(-3, 0)$ is a parallelogram.

4 sides where opposites sides are _____



Ex. 3: Graph A $(-3, 5)$, B $(5, 3)$ and C $(0, 0)$. Find the slope of segment CA and CB. What conclusion can you make about the two lines?



Perpendicular Lines

⊥ Perpendicular lines & line segments meet (or will meet) at _____ angles.

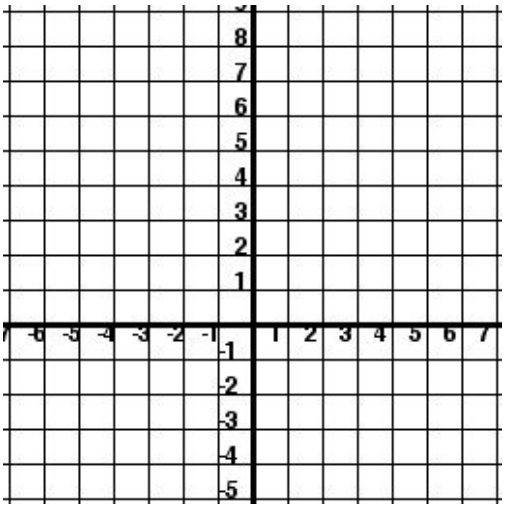
⊥ The slopes of perpendicular lines & line segments will have a product of ____.

⊥ The slopes of perpendicular lines are also referred to as _____ _____; that is, a line with slope $a, a \neq 0$, is perpendicular to a line with slope:

Ex. 4: State the slope that would be perpendicular to the slopes given

m=$\frac{2}{3}$ ⊥ m=$\frac{-1}{7}$ ⊥ m=1 ⊥ m=0 ⊥

Ex. 5: A line segment has endpoints E $(2, 3)$ and F $(-4, -1)$. Determine the coordinates of a point G so that the line EG is perpendicular to line EF.



HW p 349 #5,6,8,9,12,17

4.3 Slope-Intercept Form of the Equation for a Linear Function

Slope-Intercept Form of the Equation of a Linear Function

The equation of a linear function can be written in the form _____

where m = _____

and b = _____

Ex. 1: Graph the linear function with the equation: $y = \frac{1}{2}x + 3$

Steps:

i) Determine slope, m =

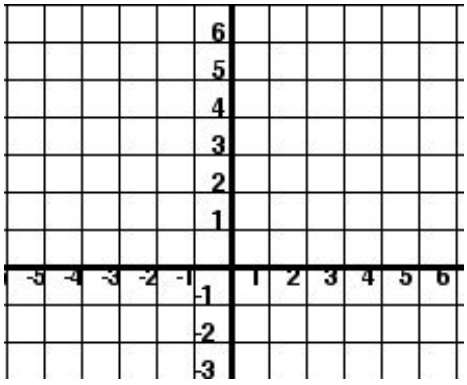
ii) Determine y-intercept, b=

iii) Plot known point (b)

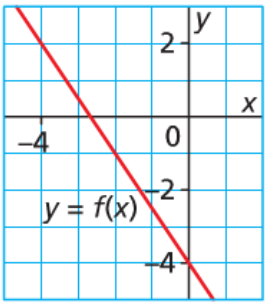
iv) From this known point, use the slope to plot the other points on the line.

m=

v) Draw a line through the points.



Ex. 2: Write an equation to describe this function. Verify the equation.



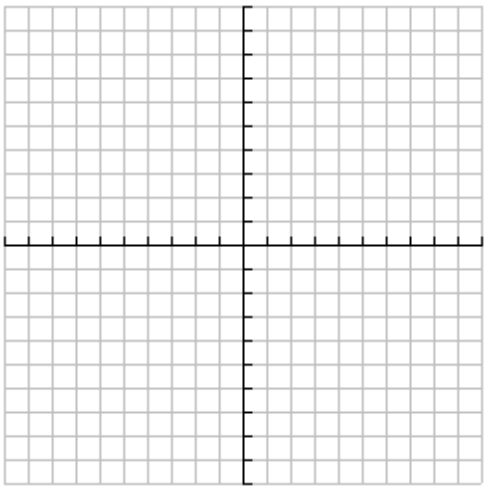
Ex. 3: Graph the lines represented by each equation. State the slope and y-intercept of each.

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

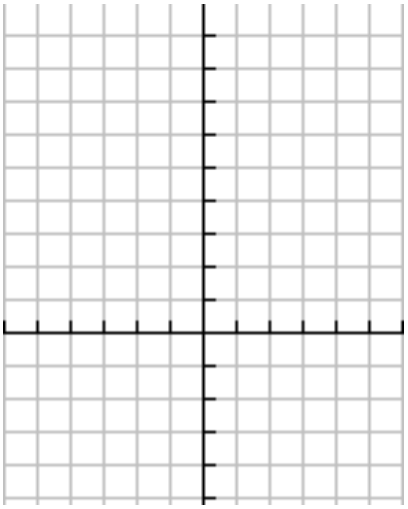
b) $y = -2x$

c) $y = 7$

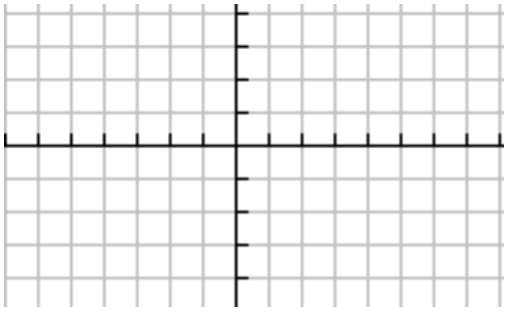
d) $x = -6$



Ex. 4: The equation of a line is $y = 3x + b$. Determine "b" when the line passes through the point $C(-1,1)$



Ex. 5: The equation of a line is $y = mx + 2$. Determine the slope (m) when the line passes through the point $A(-5,1)$



HW p362 #4-6(a,b only), 7a-d,8,12,13,23,24

Foundations and Precalculus 10

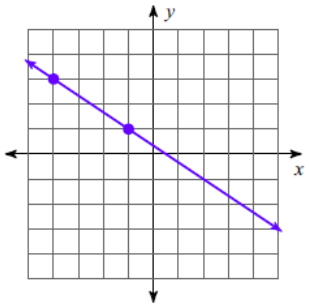
Name: _____

Block: _____

4.1-4.3 WS

Find the slope of each line.

1)



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

2) $(-19, 8), (-16, 8)$

3) $(5, -15), (-7, 1)$

Find the slope of a line perpendicular to each given line.

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

Find the value of x or y so that the line through the points has the given slope.

5) $(x, 7)$ and $(-3, -4)$; slope: $\frac{11}{7}$

6) $(0, y)$ and $(2, -9)$; slope: -3

Foundations and Precalculus 10

Name: _____

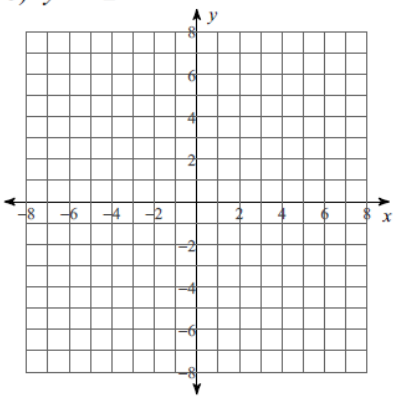
Block: _____

7) The coordinates of the vertices of a triangle are (20,10), (-35,20) and (5,-10). Find the slopes of each segment pairs to determine if it is a right triangle?

8) Draw the graphs of the linear functions with the following equations:

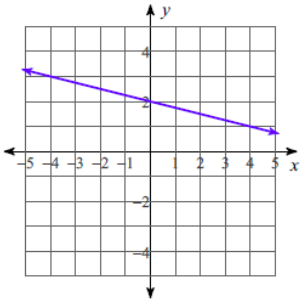
a) $y = \frac{2}{5}x + 3$

b) $y = -2$



Write the slope-intercept form of the equation of each line.

9)

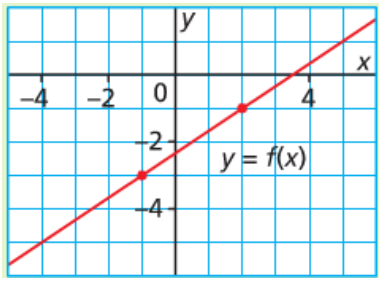


Write the slope-intercept form of the equation of the line described.

10) through: $(4, 2)$, parallel to $y = -\frac{1}{3}x - 5$

4.4 Slope-Point Form of the Equation for a Linear Function

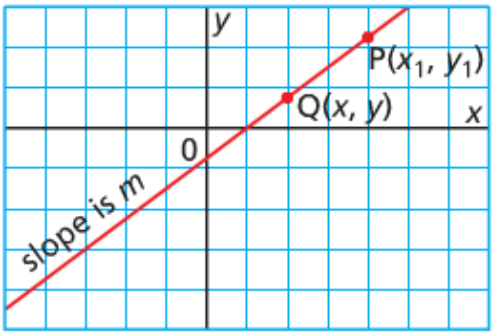
Construct your Understanding: Determine an equation for this line.



Develop a formula for the slope-point form for the equation of a line.

Consider a line that has slope m and passes through the point $P(x_1, y_2)$. Another point on the line is $Q(x, y)$

$$m = \frac{rise}{run}$$



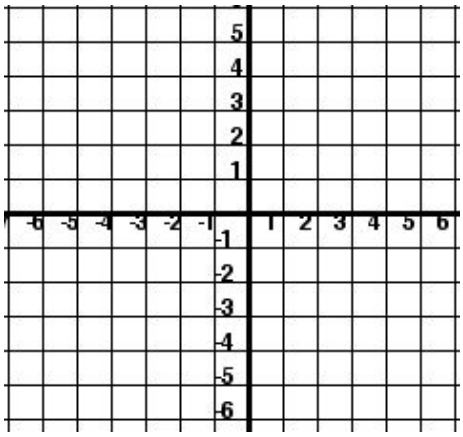
Slope-Point Form of the Equation of a Linear Function
The equation of a line that passes through $P(x_1, y_1)$ and has slope m is:

Ex. 1: Describe the graph of the linear function with this equation and then graph it:
$y - 2 = \frac{1}{3}(x + 4)$

Compare the given equation with the equation in slope-point form.

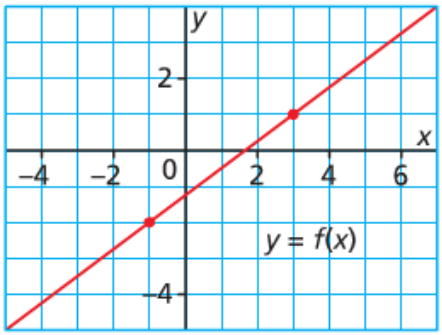
$y - y_1 = m(x - x_1)$

To match the slope-point form, rewrite the given equation so the operations are subtraction.



Ex. 2: Writing an Equation Using a Point and Slope

a) Write an equation in slope-point form for this line.



b) Write the equation in part a) in slope-intercept form.
What is the y-intercept of this line?

HW p372 #4af,5ac,7ab,9ab(i,ii), 11ab,14ab, 20a,25

Foundations and Precalculus 10

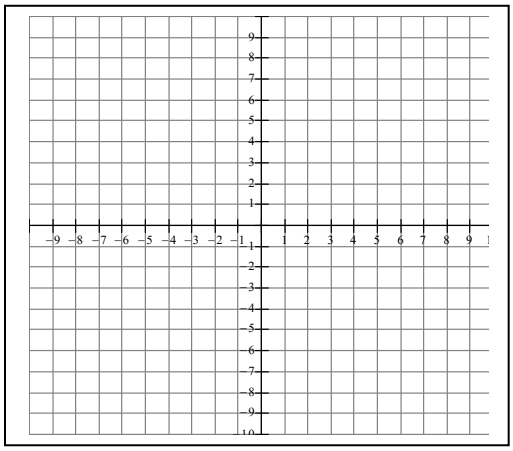
Name : _____Block : ____

Checkpoint Unit 4

1. Plot the segments AB, CD, EF on the grid then find the slope of the following segments. A(-6,5) B(3,-4) C(0,2) D(-3,-4) E(8,-5) F(8,7)

   a) AB (use $\frac{rise}{run}$ on the graph)

   AB= ____



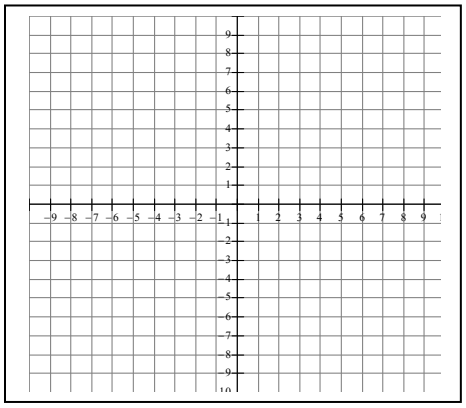
   b) CD (use the coordinate slope formula)

   CD=_____

   c) EF

   EF=_____

2. Given Δ ABC with vertices A(1,1) B(10,-2) C(7,4) determine is the triangle is a <u>right</u> triangle.



   AB=

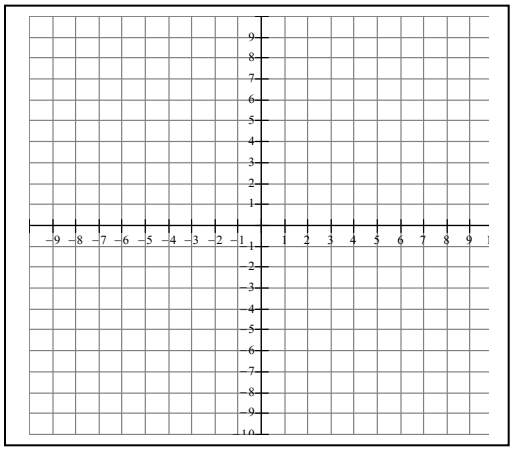
   AC=

   BC=

   Explain your answer: _____

   _____

3. On the grid provided plot each pair of points, draw each segment, and calculate the slope of each segment.



a) A(-1,3) and B(5,7) slope=____

b) C(4,-3) and D(-1,5) slope =____

c) E(2,-3) and F(-1,-5) slope=____

d) G(4,2) and H(-4,-3) slope=____

Which pairs of segments are:

Parallel	Perpendicular
Explain:	Explain:

4. Write the equation of a line in **slope intercept form.**

a) slope = -3, y-intercept = 4 _____

b) slope = $\frac{2}{7}$, y-intercept = $\frac{-1}{7}$ _____

5. The equation of a line is $y = mx + 2$ Determine the value of m when the line passes through the point (-5, 1).

_____

6. Write an equation in **slope-point form** with the slope through the point given.

   Slope = $\frac{-2}{3}$ Point (2,6) _____

7. Write an equation in **slope-point form** through the given points.

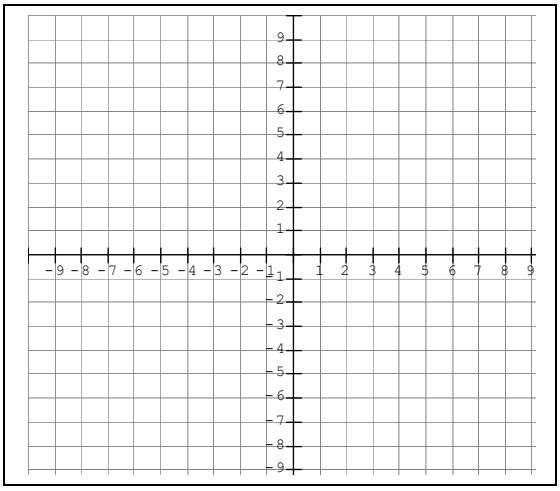
   (-3,5); (6,-4) _____

8. Determine the equation of a line in **slope-point form** with a y-intercept of -2 that is perpendicular to the line passing through (-1,3) and (5,1).

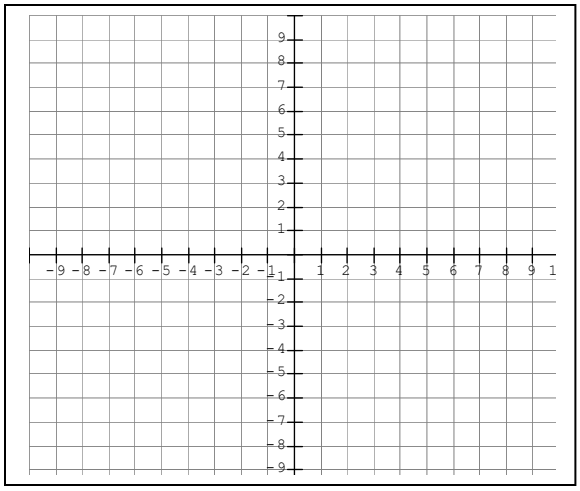
   _____

9. Graph the lines on the grids. PLOT THREE POINTS MINIMUM.

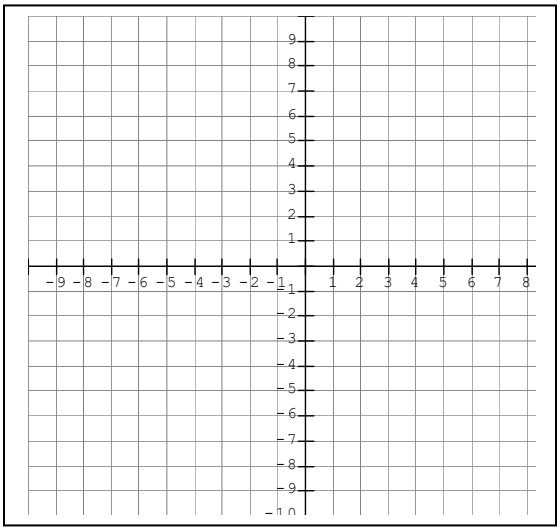
a) through point (3, -2); slope = $\frac{3}{5}$



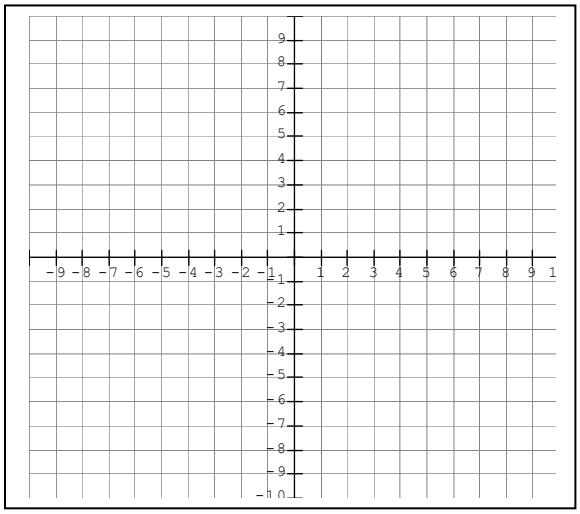
b) $y = -3x + 5$



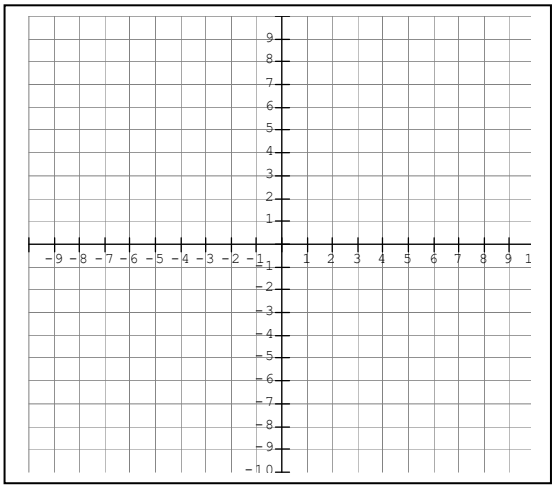
c) y-intercept=2; slope= $\frac{-2}{3}$



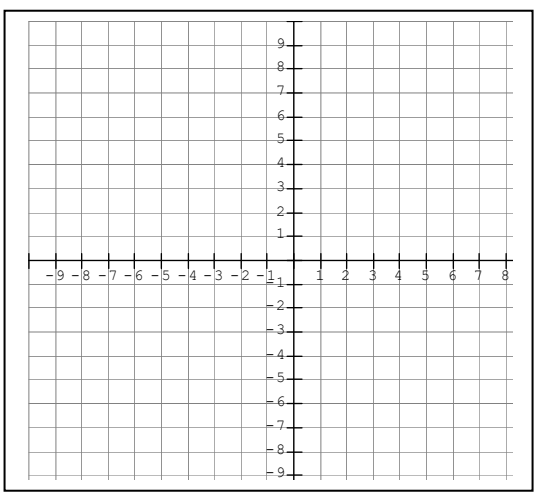
d) $y = \frac{2}{5}x$



e) $y + 6 = \frac{3}{2}(x - 5)$



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



4.5 General Form of the Equation for a Linear Function

General Form of the Equation of a Linear Relation
$\boldsymbol{Ax + By + C = 0}$
is the general form of the equation of a line,
where A is a whole number, and B and C are integers.

Ex. 1: Write each equation in general form.

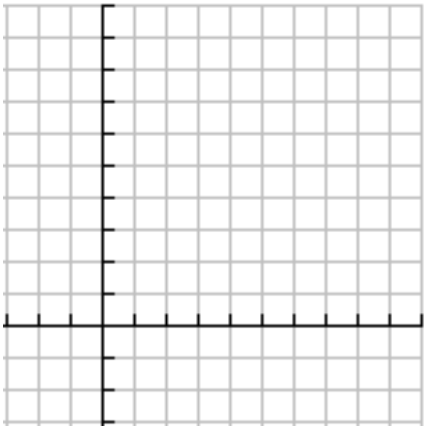
a) $y = -\frac{2}{3}x + 4$

b) $y - 1 = \frac{3}{5}(x + 2)$

Ex. 2: Graph the line whose equation is $3x + 2y - 18 = 0$ by finding the *x*- and *y*-intercepts of the line.

Determine the *x*-intercept:

Determine the *y*-intercept:



Ex.3: Determine the slope of a line with the equation: $3x - 2y - 16 = 0$

HW p384 #4,5ab,6-8,13ab,14ab,15,18

Foundations Pre Calculus 10

Name : _____Block:_____

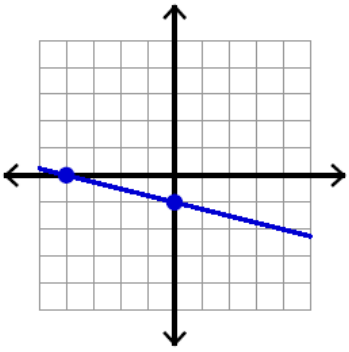
Unit 4 – Linear Functions Review

1. Determine the slope of a line passing through the following points and tell whether the slope is positive, negative, zero or undefined.
   a. P (3 , -2) and Q (-1 , 6)

   b. R (2 , 4) and S (2 , -1)

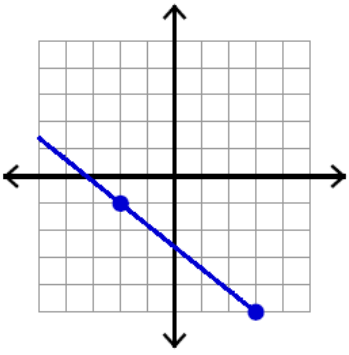
1. Given the graph write the equation of the line in:
   a) Slope point form

   b) Slope intercept form



2. Given the graph write the equation of the line in:
   a) Slope point form

   b) Slope intercept form



3. Write an equation for the line that passes through A(4,3) and is parallel to the line $y = \frac{1}{2}x + 2$.
   a) Slope point form

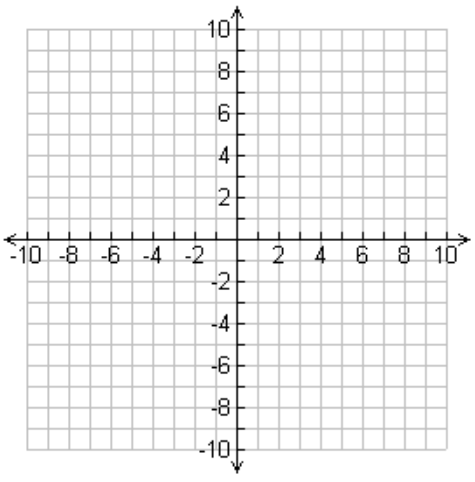
   b) Slope intercept form

4. Write an equation for the line that passes through A(-4,1) and is perpendicular to the line $y = \frac{2}{3}x + 6$
   a) Slope point form

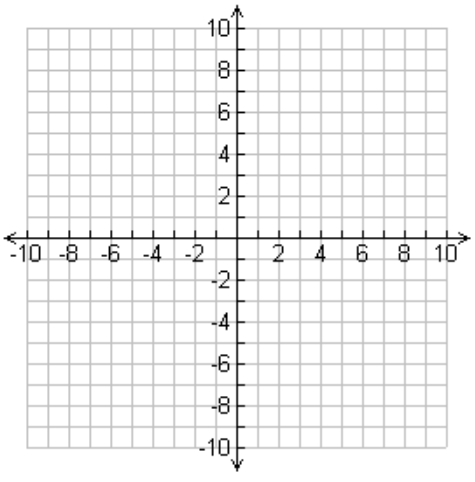
   b) Slope intercept form

5. Graph the lines.

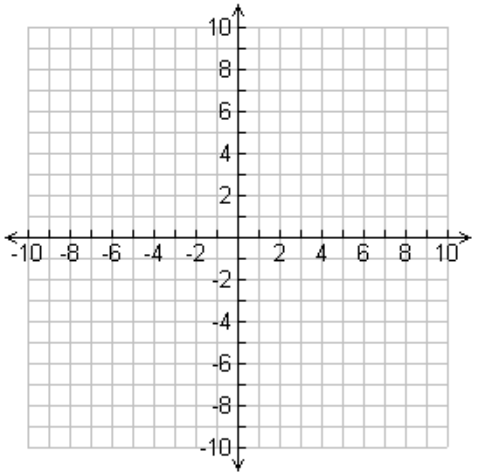
a) $4x + y - 8 = 0$



b) $3x - 4y - 24 = 0$



6. Two **perpendicular** lines intersect on the y-axis. One line has equation: $y - 4 = \frac{2}{3}(x + 6)$. What is the equation of the other line in Slope-Point Form?



General Form: $Ax + By + C = 0$

7. Write: $y = \frac{-2}{5}x + 2$ in General Form.

8. Write: $y - 5 = \frac{2}{5}(x - 7)$ in General Form.

9. Determine the x-intercept and the y-intercept of the line whose equation is: $6x - 4y - 3 = 0$

x-intercept: _____ y-intercept:_____

10. Determine the slope of a line with equation: $2x - 4y + 10 = 0$

Name:_____ Block: ___

Unit 4 Extra Review

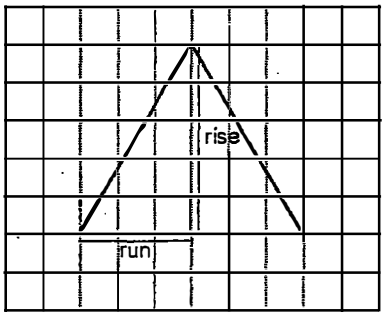
Multiple Choice
Identify the choice that best completes the statement or answers the question.

ANSWER

____ 1. Determine the slope of the line that passes through G(3, –3) and H(–5, 9).

a. $\frac{3}{2}$
c. $\frac{2}{3}$
b. $-\frac{2}{3}$
d. $-\frac{3}{2}$

____ 2. Determine the steepness of this roof by calculating its slope.



a. $-\frac{5}{3}$
c. $\frac{3}{5}$
b. $\frac{5}{3}$
d. $-\frac{3}{5}$

____ 3. A road rises 9 m for every 60 m measured horizontally. Determine the slope of the road.

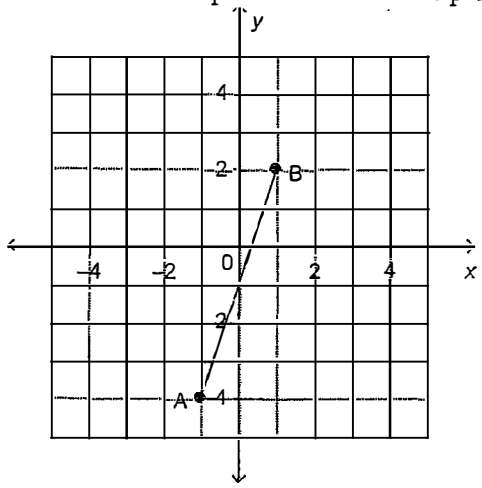
a. $-\frac{20}{3}$
c. $\frac{20}{3}$
b. $-\frac{3}{20}$
d. $\frac{3}{20}$

____ 4. A line has x-intercept 2 and y-intercept 6? Determine the slope of the line.

a. $\frac{1}{3}$
c. -3
b. 3
d. $-\frac{1}{3}$

ANSWER

___ 5. Determine the slope of the line that is perpendicular to this line segment.



a. 3

b. 3

c. $\frac{1}{3}$

d. $-\frac{1}{3}$

___ 6. Determine the slope of a line that is perpendicular to the line through W(–9, 7) and X(6, –10).

a. $-\frac{15}{17}$

b. $-\frac{17}{15}$

c. –15

d. $\frac{15}{17}$

___ 7. A line has x-intercept –5 and y-intercept 1. Determine the slope of a line parallel to this line.

a. –5

b. $-\frac{1}{5}$

c. 5

d. $\frac{1}{5}$

___ 8. A line passes through D(–5, 3) and N(12, –4). Determine the coordinates of two points on a line parallel to DN.

a. (6, –10) and (24, –8)

b. (–10, 24) and (6, –8)

c. (–10, 6) and (24, –8)

d. (–10, 6) and (–8, 24)

___ 9. Predict what will be common about the graphs of these equations.

i) $y = 3x + 6$

ii) $y = 3x - 5$

iii) $y = 3x - 6$

iv) $y = 3x + 5$

a. All the graphs will have the same slope.

b. All the graphs will have the same x-intercept.

c. All the graphs will have the same y-intercept.

d. None of the above.

___ 10. Write an equation for the graph of a linear function that has slope $-\frac{1}{3}$ and y-intercept –3.

a. $y = -3x - \frac{1}{3}$

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

c. $y = \frac{1}{3}x + 3$

d. $y = 3x - \frac{1}{3}$

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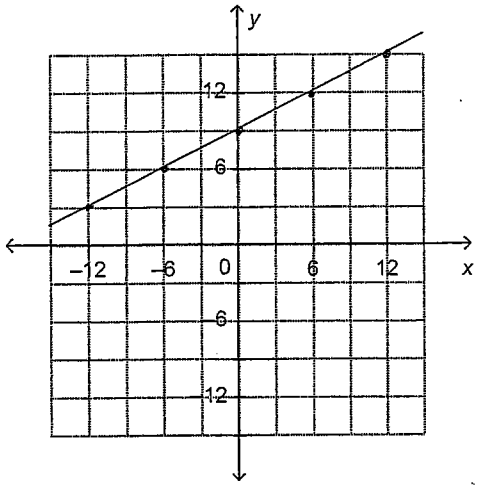
ANSWER

____ 11. To join a tennis club, Josephine pays a start-up fee of $130, plus a monthly fee of $24. Write an equation to represent the total cost, C dollars, for t months of membership.

a. $t = 24C + 130$
b. $C = 24t + 130$
c. $C = 24t - 130$
d. $C = 130t + 24$

____ 12. Write an equation to describe this graph.



a. $f(x) = -\frac{1}{2}x + 9$
b. $f(x) = \frac{1}{2}x - 9$
c. $f(x) = -\frac{1}{2}x - 9$
d. $f(x) = \frac{1}{2}x + 9$

____ 13. Which equations represent perpendicular lines?

a. $y = 6x - 7,\ y = 6x + 7$
b. $y = -7x + 11,\ y = \frac{1}{7}x + 6$
c. $y = 11x - 7,\ y = 11x + \frac{1}{7}$
d. $y = \frac{1}{6}x + 6,\ y = 6x + 6$

____ 14. Describe the graph of the linear function with this equation: $y - 7 = -5(x + 8)$

a. The graph is a line through (8, –7) with slope –5.
b. The graph is a line through (–8, 7) with slope –5.
c. The graph is a line through (–8, 7) with slope 5.
d. The graph is a line through (8, –7) with slope 5.

____ 15. Write this equation in slope-intercept form: $y - 3 = -\frac{1}{5}(x + 2)$

a. $y = -\frac{1}{5}x + \frac{13}{5}$
b. $y = -\frac{3}{5}x + \frac{13}{5}$
c. $y = -x + \frac{13}{5}$
d. $y = \frac{1}{5}x + \frac{13}{5}$

____ 16. Determine the y-intercept of the graph of this equation: $y - 3 = 4(x + 5)$

a. 3
b. –23
c. 23
d. –20

12

____ 17. Write an equation in slope-point form for the line that passes through A(–2, 4) and B(–9, 6).

a. $y-6=-\frac{2}{7}(x+2)$

b. $y+4=-\frac{2}{7}(x-2)$

c. $y-4=-\frac{2}{7}(x+2)$

d. $y+6=\frac{2}{7}(x-2)$

____ 18. Write an equation for the line that passes through T(–3, 3) and is parallel to the line $y=7x-10$.

a. $y+3=-\frac{1}{7}(x-3)$

b. $y+3=7(x-3)$

c. $y-3=-\frac{1}{7}(x+3)$

d. $y-3=7(x+3)$

____ 19. Write this equation in general form: $y=3x+5$

a. $-3x+y-5=0$

b. $3x+y+5=0$

c. $3x-y+5=0$

d. $3x-y-5=0$

____ 20. Write this equation in general form: $y+5=\frac{5}{3}(x-3)$

a. $5x-3y=-8$

b. $5x-3y-8=0$

c. $5x-3y-30=0$

d. $5x+3y-30=0$

____ 21. Determine the slope of the line with this equation: $7x+3y+5=0$

a. $-\frac{7}{3}$

b. $\frac{3}{7}$

c. $\frac{7}{3}$

d. $-\frac{3}{7}$

____ 22. Write this equation in slope-intercept form: $10x+3y-4=0$

a. $y=\frac{10}{3}x+\frac{4}{3}$

b. $y=-\frac{10}{3}x+\frac{4}{3}$

c. $y=\frac{10}{3}x-\frac{4}{3}$

d. $y=-\frac{10}{3}x-4$

____ 23. Which equation is equivalent to $2x-3y-9=0$?

a. $y=\frac{2}{3}x+3$

b. $y+1=-\frac{2}{3}(x-6)$

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

d. $y-7=\frac{2}{3}(x-6)$

____ 24. A line has x-intercept –9 and y-intercept 3. Determine the equation of the line in general form.

a. $3x+9y-27=0$

b. $3x-9y-27=0$

c. $3x-9y+27=0$

d. $3x+9y+27=0$