Tour d'Algebra

Stage 1   Semester 1

Team Name: __KEY__

Write an equation of the line in (a) slope-intercept form, (b) point-slope form, and (c) standard form

1) $(-10, 7), (3, -3)$ — with -10 crossed out and -7 written above

$m = -2$

$b = 3$

$\dfrac{17 - -3}{-7 + 3} = \dfrac{20}{-10} = -2$

$-3 = -2 \cdot 3 + b$

$-3 = -6 + b$

$b = 3$

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

$x_1 y$ same side

a) $y = -2x + 3$

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

   $y - 17 = -2(x + 7)$

c) $y + 2x = 3$

2) $(4, -2), (8, -5)$

$m = -\frac{3}{4}$

$b = 1$

$\dfrac{-2 - -5}{4 - 8} = \dfrac{-2 + 5}{-4} = -\frac{3}{4}$

$y = mx + b$

$-2 = -\frac{3}{4} \cdot 4 + b$

$-2 = -3 + b$

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

b) $\left(y + 2 = -\frac{3}{4}(x - 4) \right.$

   $\left. y - 8 = -\frac{3}{4}(x + 5) \right)$

c) $y + \frac{3}{4}x = 1$

Find the x and y intercepts of the equations. NO DECIMAL ANSWERS!

Must be reduced, improper fractions ok

3) $5x + 10y = 30$

x	y
6	0
0	3

x-int = 6 $(6, 0)$

y-int = 3 $(0, 3)$

4) $7x + 8y = 18$

x	y
$\frac{18}{7}$	0
0	$\frac{18}{8}$

x-int = $\frac{18}{7}$

y-int = $\frac{9}{4}$

Graph the equation USING THE INTERCEPTS. Label the intercepts

5)

$$7x - 7y = 42$$
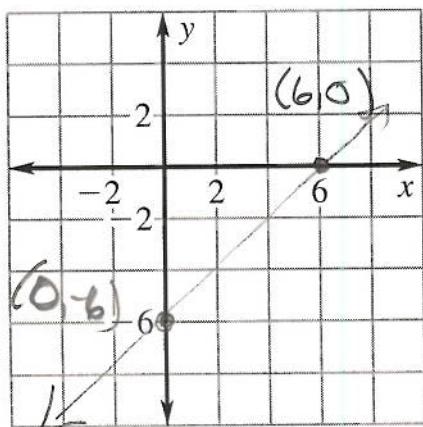
x	y
6	0
0	-6

$(6, 0)$

$(0, -6)$

Is the given point a solution to the system of equations? (show work!!)

6) $9x + 7y = 8$ $(-3, 5)$ 6. ___yes___
         $8x - 9y = -69$

$$-27 + 35 = 8 \checkmark$$
$$-24 - 45 = -69 \checkmark$$

Solve the linear system by <u>substitution</u>. Show all work.

7) $2x + y = 9 \longrightarrow \quad y = \boxed{-2x+9}$ 7. __(3, 3)__
         $2x + 3y = 15$

$$2x + 3(-2x + 9) = 15$$
$$2x + -6x + 27 = 15$$
$$-4x = -12$$
$$x = 3$$

Solve the linear system by <u>elimination</u>. Show all work. Tricky

8) $-8y + 6x = 36$ $-1(-8y + 6x = 36)$ 8. __(2, -3)__
         $6x - y = 15$ $-y + 6x = 15$

$6x + 3 = 15$ $8y - 6x = -36$

$6x = 12$ $7y = -21$

$x = 2$ $y = -3$

9) Solve the inequality (means graph the solution set)
 $y > 3x - 2$
        $\frac{}{3}$

y-int.

$$0 > 3(0) - 2$$
$$0 > -2$$

$x > 2$
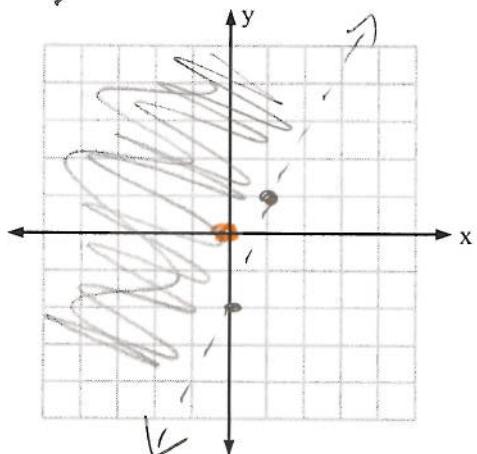
Stage 1

Tour d'Algebra

Stage 2   Semester 1

Team Name: _____Key_____

1) Write an equation of the line that passes through the given point and is parallel to the given line

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

new line
m = 2
b = 5

$3 = 2(-1) + b$
$3 = -2 + b$
$b = 5$

parallel
same slope

$y = 2x + 5$

2) Write an equation of the line that passes through the given point and is perpendicular to the given line

$(-9, 2), y = 3x - 12$

new line
$m = -\frac{1}{3}$
$b = -1$

$2 = -\frac{1}{3}(-9) + b$
$2 = 3 + b$
$b = -1$

perp.
slope is neg. reciprocal

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

Solve the inequalities. Graph the solution.

3) $4 + m \geq 1$
$ -4 \quad\quad -4$
$\overline{ m \geq -3}$
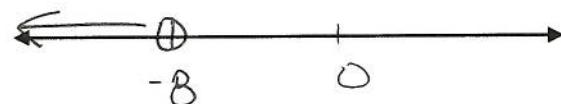
3. $m \geq -3$

4) $-2t > 16$
$\frac{-2t}{-2} \quad \frac{16}{-2}$
$t < -8$

4. $t < -8$

5) $\frac{h}{-5} > 7$
$h < -35$

5. $h < -35$
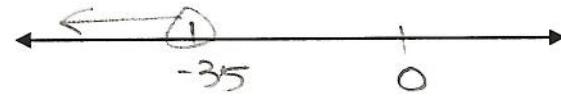
6) $x + 3 \leq -2$ or $10x - 3 > x + 15$
$ -3 \quad -3 +3 \quad\quad +3$
$x \leq -5 10x > x + 18$
$ 9x > 18$
$ x > 2$

6. $x \leq -5$ or $x > 2$
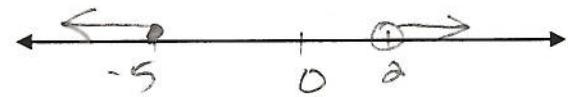
7) $-6 \leq 5x + 14 \leq 24$
$-14 \quad\quad -14 \quad 14$
$-20 \leq \frac{5x}{5} \leq 10$

7. $-4 \leq x \leq 2$

Evaluate the expressions

8) $6 \cdot 9 - 33 \div 11$

$54 - 3$

_____51_____

9) $\dfrac{6(m-1)}{2m+3}$ when $m = 6$

$\dfrac{6(5)}{15} = \dfrac{30}{15}$

_____2_____

10) $5[(4+9) - 3^2] \div 2$

$5[(13) - 9] \div 2$

$5(4) \div 2$

_____10_____

11)

Picture Frames You are purchasing wood to make 5 picture frames that are all the same size. The expression $5(2x + 2y)$ represents the total amount of wood you need to make the frames where x is the width of a frame (in inches) and y is the length of a frame (in inches). Find the amount of wood you need to make the frames if each frame is 8.25 inches wide and 10.5 inches long.

_____187.50_____

$\overset{X}{}\qquad\overset{Y}{}$

$5(2 \cdot 8.25 + 2 \cdot 10.5)$

$5(16.50 + 21) \qquad 5(37.50)$

Write an equation or inequality for the situations described

12) The sum of 7 and three times a number b is at least 12.

$3b + 7 \geq 12$
$7 + 3b \geq 12$

13) The sum of 14 and twice a number y is equal to 78.

$14 + 2y = 78$
$2y + 14 = 78$

14) The product of 3 and a number x is at most 21.

$3x \leq 21$

15) The difference of 22 and the quotient of a number m and 4 is 54.

$22 - \dfrac{m}{4} = 54$

Stage 2

Tour d'Algebra

Stage 3   Semester 1

Team Name: **Key**

Evaluate the function when $x = -3$

1) $s(x) = \frac{4}{5}x - 2$

$\frac{4}{5} \cdot -3 - 2$

$\frac{-12}{5} - \frac{10}{5}$

$s(-3) = \frac{-22}{5}$ or $-4\frac{2}{5}$

2) $g(x) = -9x + 1$

$-9(-3)+1 =$

$g(-3) = 28$

Find the value of x so that the function has the given value.

3) $g(x) = -3x + 8; \; 14$ $\leftarrow g(x)$

$\underset{-8\quad\quad-8}{14 = -3x + 8}$

$6 = -3x$

$x = -2$ so $g(-2) = 14$

4) $s(x) = -4x - 9; \; 3$

$\underset{+9\qquad\quad+9}{3 = -4x - 9}$

$12 = -4x$

$x = -3$ so $s(-3) = 12$

Solve the system of equations using whatever method is appropriate

5) $\begin{array}{l} -4(7x - 6y = -1) \\ 6(5x - 4y = 1) \end{array}$ $\longrightarrow$ $\begin{array}{l} -28x + 24y = 4 \\ 30x - 24y = 6 \end{array}$

$2x = 10$

$x = 5$

$5(5) - 4y = 1$
$25 - 4y = 1$
$-4y = -24$

$(5, 6)$

6) $\begin{array}{l} 3x - 2y = 3 \\ -x + y = 1 \end{array} \rightarrow y = x + 1$

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

$3x - 2x - 2 = 3$

$\underset{+2\quad\;\;2}{x - 2 = 3}$

$x = 5$

$(5, 6)$

Write a rule for the function represented by the graph. Identify the domain and range of the function.

7)
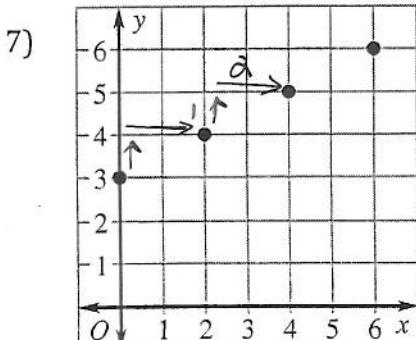
$m = \frac{1}{2}$

$b = -3$

equation $\rightarrow$ Rule: $y = \frac{1}{2}x + 3$

Domain: $0, 2, 4, 6$ $0 \leq x \leq 6$

Range: $3, 4, 5, 6$ $3 \leq y \leq 6$

Give the most specific classification of each of the numbers. After, order them from least to greatest.

8) $\overset{2.236\cdots}{\underset{\sqrt{5}}{|}}$, -6, 2.5, $\overset{-4.8}{-\dfrac{24}{5}}$

$\sqrt{5}$ irrational $\quad -6$ integer
$(2.236067977\ldots)$

2.5 rational $\quad -\dfrac{24}{5}$ rational

$-6 \quad -4.8 \quad 0 \quad \sqrt{5} \; 2.5$

Order: $-6, -4.8, \sqrt{5}, 2.5$

9) What $\overset{x}{\text{number}}$ is 12% of 225? or $.12\,(225)$ $\qquad\qquad 27$

$\dfrac{x}{225} = \dfrac{12}{100}$

10) What percent of 160 is 128? $\qquad\qquad 80\%$

$\dfrac{128}{160} = \dfrac{x}{100}$

11) $y = 2x - 2$; domain: $x \geq 0$
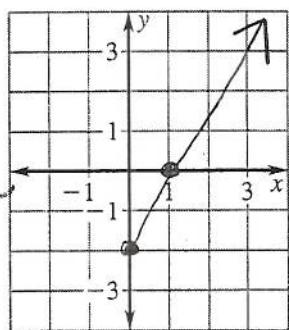
no pts Graph part of 11

Range: $y \geq -2$

12) **Bicycle Rental** A bicycle rental shop rents bicycles for \$8 per hour. The total cost c (in dollars) for renting a bicycle h hours is given by the function $c = 8h$. Once you get to the rental shop, you figure you can rent a bicycle _for at most 5 hours_. Graph the function and identify its domain and range. What is the most that you will pay for renting the bicycle?

$c = 8h$

h	c
0 hours $\;$ 0	0
5 hours $\;$ 5	40

Bicycle Rental
Cost (dollars): 0 10 20 30 40 50
Hours: 0 1 2 3 4 5 h
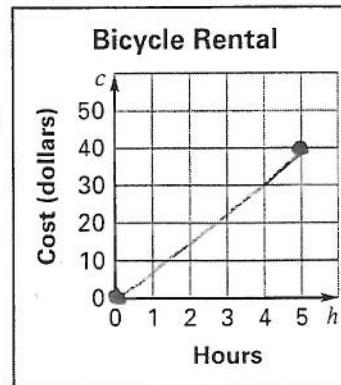
Domain: $0 \leq h \leq 5$ Range: $0 \leq c \leq 40$ Most you pay: \$40

Tour d'Algebra

Stage 4   Semester 1

Team Name:_____

Solve the absolute value equation.

1) $|x - 5| = 3$

$$x - 5 = -3 \qquad x - 5 = 3$$
$$+5 \quad +5 \qquad +5 \quad +5$$
$$x = 2 \qquad\qquad x = 8$$

✔ $X = 2 \quad X = 8$

2) $|3x + 1| + 1 = 5$

$$\underline{-1 \quad -1}$$
$$|3x + 1| = 4$$

$$3x + 1 = 4 \qquad 3x + 1 = -4$$
$$\underline{-1 \quad -1} \qquad \underline{-1 \quad -1}$$
$$3x = 3 \qquad\quad 3x = -5$$
$$x = 1 \qquad\qquad x = -\tfrac{5}{3}$$

✔ $X = 1 \quad X = -\tfrac{5}{3}$

Solve the absolute value inequality. Graph your solution.

3) $|2x + 5| < 3$

$$2x + 5 < 3 \qquad\text{and}\qquad 2x + 5 > -3$$
$$\underline{-5 \quad -5} \qquad\qquad \underline{-5 \quad -5}$$
$$\frac{2x}{2} < \frac{-2}{2} \quad x < -1 \qquad \frac{2x}{2} > \frac{-8}{2}$$
$$\qquad\qquad\qquad\qquad x > -4$$

✔ $x < -1 \quad x > -4$

4) $2|x + 5| - 1 \geq 3$

$$\underline{+1 \quad +1}$$
$$\frac{2|x+5|}{2} \geq \frac{4}{2}$$
$$|x + 5| \geq 2$$
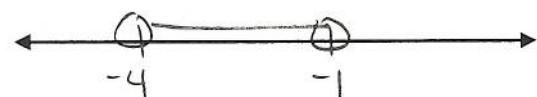
$$x + 5 \geq 2 \qquad x + 5 \leq -2$$
$$\underline{-5 \quad -5} \qquad \underline{-5 \quad -5}$$
$$x \geq -3 \qquad\quad x \leq -7$$

✔ $X \geq -3 \quad X \leq -7$

For #s 5 & 6, make a scatter plot of the data. Describe the correlation of the data.

5)

| x	-2	-2	-1	0	1	1	2
y	-4	-3	-2	-1	0	2	1
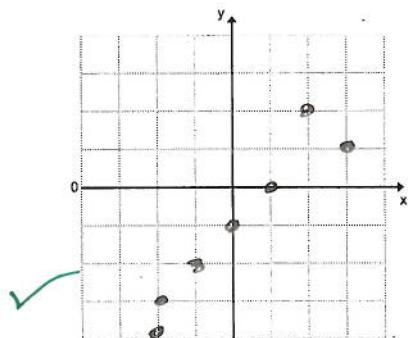
Correlation __positive__

6)

x	-4	-3	-2	-2	-1	0	1
y	7	5	6	3	4	2	1
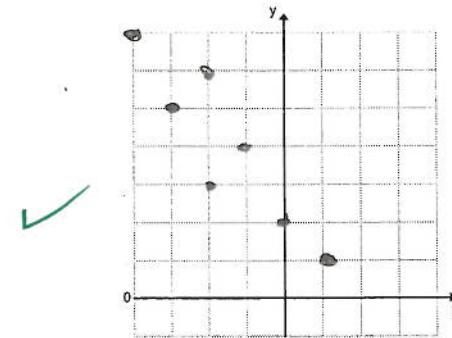
Correlation __negative__

7) Graph the system of linear inequalities.

$$y - 2x < 4$$
$$y + 2x \geq 1$$

$\rightarrow$

x	y
-2	0
0	4

$\searrow$

x	y
$\frac{1}{2}$	0
0	1
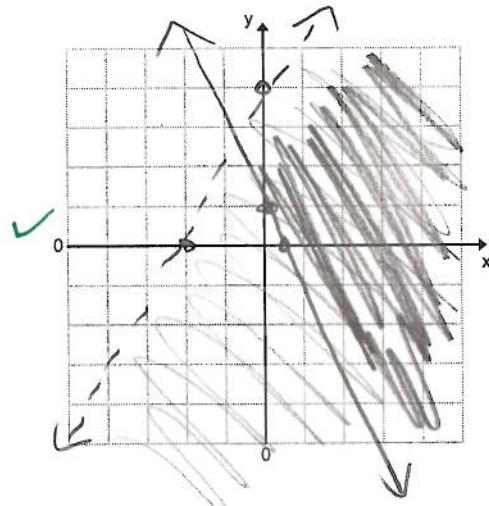
8) Solve the system of equations

$$11x - 20y = 28$$
$$5(3x + 4y = 36)$$

$$24 + 4y = 36$$
$$4y = 12$$

$$11x - 20y = 28$$
$$15x + 20y = 180$$
$$\overline{26x = 208}$$

✓ $(8,3)$

Solve the equation

9) $\frac{4}{3} \cdot \frac{3}{4}(n+3) = 9 \cdot \frac{4}{3}$ $n + 3 = 12$ ✓ 9) $n = 9$

10) $10a + 5(a-3) = 15$
$10a + 5a - 15 = 15$
$15a - 15 = 15$

$\frac{15a}{15} = \frac{30}{15}$
$a = 2$

✓ 10) $a = 2$

11) $7 + x = \frac{1}{2}(4x - 2)$
$7 + x = 2x - 1$
$-x \quad -x$

$7 = x - 1$

✓ 11) $x = 8$

12) $16p - 4 = 4(2p - 3)$
$16p - 4 = 8p - 12$
$+4 \quad +4$

$16p = 8p - 8$
$-8p \quad -8p$
$\overline{8p = -8}$

✓ 12) $p = -1$

13) $\frac{5x}{x+1} = \frac{30}{9}$

$30(x+1) = 5x(9)$
$30x + 30 = 45x$
$30 = 15x$

✓ 13) $x = 2$

14) Find the zero of the function

$$f(x) = 17x - 34$$
$$0 = 17x - 34$$
$$+34 \quad +34$$
$$34 = 17x$$

✓ 14) $x = 2$

Stage 4

Tour d'Algebra

Stage 5   Semester 1

Team Name: ___Key___

Find the slope of the line through the given points

1)   (1 , 2) and (7 , 7) $\frac{2-7}{1-7} = \frac{-5}{-6}$ $m = \frac{5}{6}$

2)   (1 , −2) and (5 , 8) $\frac{-2-8}{1-5} = \frac{-10}{-4}$ $\frac{10}{4} = \frac{5}{2}$

3) $f(-3) = 10$ and $f(3) = 1$ $\frac{10-1}{-3-3} = \frac{9}{-6}$ $\frac{-9}{6} = \frac{-3}{2}$

   $(-3, 10) \quad (3, 1)$

4)   5) $\frac{3}{5}$


                                                                                     0
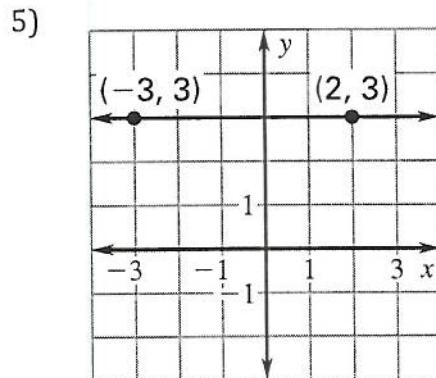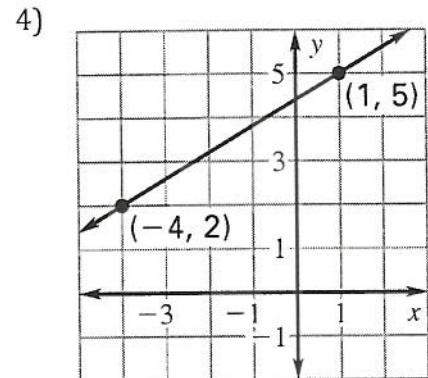
Graph the equation

6) $y = 5x + 4$ 7) $4x + 6y = 12$
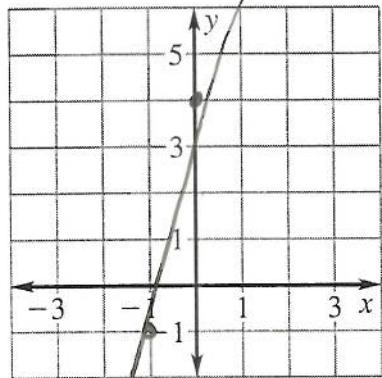
x	y
3	0
0	2
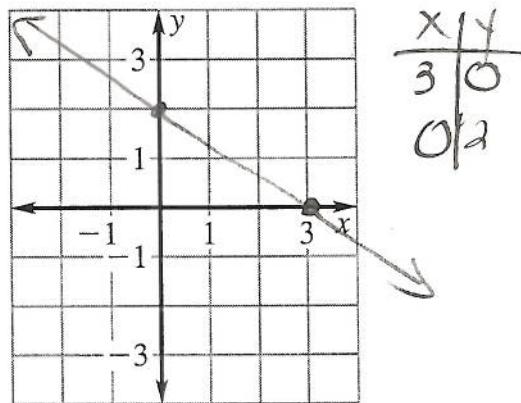
Solve the equation, if possible

8) $4(3a+5)=\dfrac{1}{2}(24a+40)$ infinitely many

$12a+20 = 12a+20$ 0

9) $-\dfrac{2}{3}d+1=9$ $d=-12$

            $\underline{\hspace{1.5em} -1 \hspace{0.5em} -1 \hspace{3em}}$

    $-\dfrac{3}{2}\cdot-\dfrac{2}{3}d=8\cdot-\dfrac{3}{2}$

           $d=-\dfrac{24}{2}$

10) $\dfrac{1}{3}(a+4)=4$ $a=8$

         $a+4=12$

          $a=8$

11. A caterer knows that 18 heads of lettuce are needed to make dinner salads for 90 people. How many heads of lettuce are needed for a party of 150 people?

$$\dfrac{18}{90}=\dfrac{x}{150}$$

                                              30 heads

Simplify the expression. Reduce answers and leave in fraction form if possible.

12) $10x-(x+3)$ 13) $-2x(x-6)$ $9x-3$

      $10x-x-3$ $-2x^2+12x$

         $9x-3$ $-2x^2+12x$

14) $\dfrac{-6x+15}{-10}$ 15) $\dfrac{14x-2}{2}$ $-\dfrac{3}{5}x+-\dfrac{3}{2}$

    $-\dfrac{6x}{10}+\dfrac{15}{-10}$ $7x-1$

      $-\dfrac{3x}{5}+-\dfrac{3}{2}$ Stage 5