



DeSoto
COUNTY SCHOOLS

Yearlong/Semester
Algebra I

Week 8

Name: _____

Date: _____

Writing Equations of Lines Algebra 1

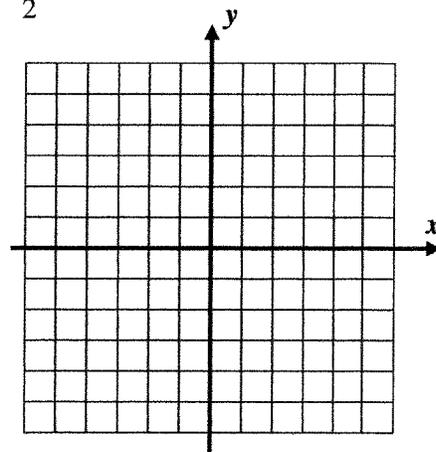
It is important to be able to move between the graphical and algebraic forms of a line. The following exercise begins this process.

Exercise #1: Consider the linear function given by the equation $y = \frac{3}{2}x - 3$.

(a) Using your calculator to generate an xy -chart, plot the function on the grid at the right.

(b) Determine the slope of this line graphically.

(c) Determine the y -intercept of this line graphically.



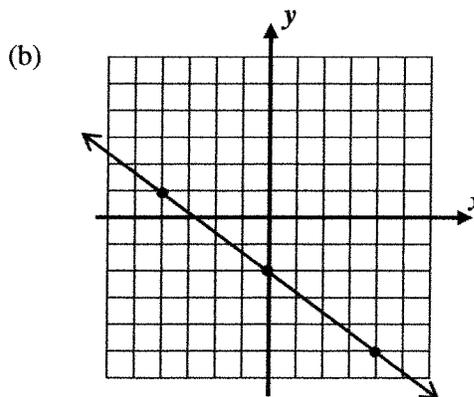
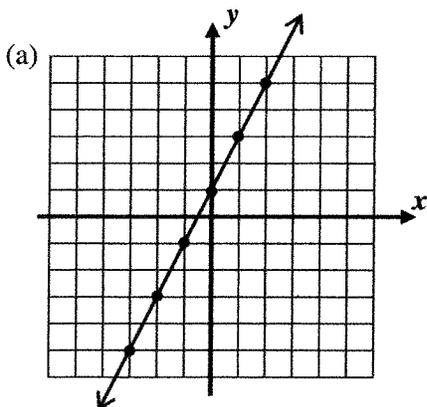
THE SLOPE-INTERCEPT FORM OF A LINE

$$y = mx + b$$

m = slope and b = the y -intercept

A good way to think about the y -intercept, b , is that it is where a line **b**egins on the y -axis. A good way to think about the slope, m , is it gives the **m**ovement of the line.

Exercise #2: Write the equation, in $y = mx + b$ form, for each line shown below.



Equation: _____

Equation: _____

Writing Equations of Lines – We want to develop the skill of writing equations of lines, in $y = mx + b$ form, using a variety of information. In each of these problems, though, the end-goal is the same, to determine the value for the slope and the value of the y-intercept.

Exercise #3: Write the equation of a line in $y = mx + b$ form that is parallel to the line $y = 2x + 4$ and has a y-intercept of -8 .

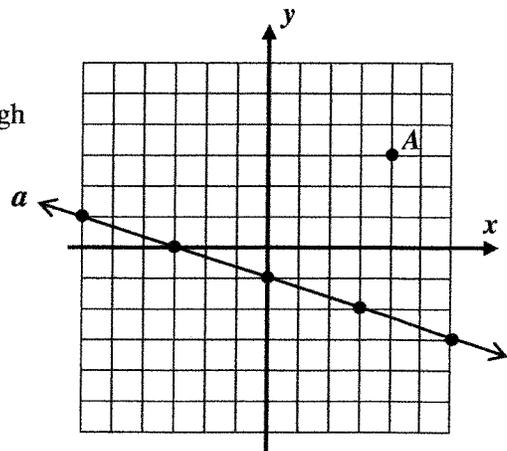
Exercise #4: Write the equation of the line passing through the point $(1, 8)$ with a slope of 3.

Exercise #5: Consider a line that passes through the points $(4, 10)$ and $(6, 11)$.

- (a) Find the line's slope. (b) Find the line's y-intercept algebraically.
- (c) Write the equation for the line in $y = mx + b$ form. (d) Using a table on your graphing calculator, verify that the two points given fall on this line.
- (e) Using your calculator table, determine the y-coordinate of this line when $x = 24$. (f) Using your calculator table, determine the x-coordinate on the line when $y = 30$.

Exercise #6: Line a is shown on the grid below.

- (a) On the same set of axes, sketch the line that passes through point $A(4, 3)$ and is parallel to line a .
- (b) Write the equation of the line that you just drew.



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Writing Equations of Lines Algebra 1 Homework

Skills

1. Write the equation of the line, in $y = mx + b$ form, for each set of information given.

(a) a slope of $\frac{2}{3}$ and a y-intercept of 9

(b) a slope of $-\frac{1}{2}$ and a y-intercept of 0

(c) a slope of 6 and a y-intercept of 3

(d) a slope of 0 and a y-intercept of 2

2. Which of the following lines is parallel to a line whose equation is $2y = 3x + 10$? Hint – Arrange this line in its $y = mx + b$ form first.

(1) $y = 2x + 5$

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

(2) $y = 3x + 2$

(4) $y = \frac{2}{3}x - 6$

3. Which of the following lines has a slope of 5 and a y-intercept of -3 ?

(1) $y = 5x - 3$

(3) $y = -3x + 5$

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

(4) $y = 3x - 5$

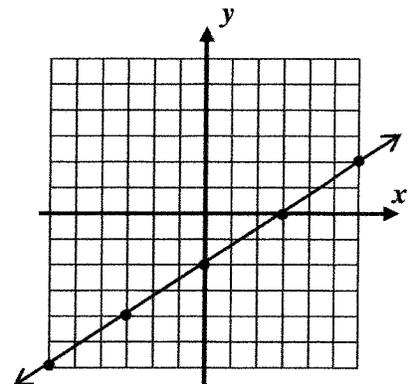
4. Which of the following is the equation for the graph shown at the right?

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

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

(2) $y = x - 2$

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



5. Which of the following is the y-intercept of the line whose slope is 4 and which passes through the point $(8, 15)$?

(1) 15

(3) 8

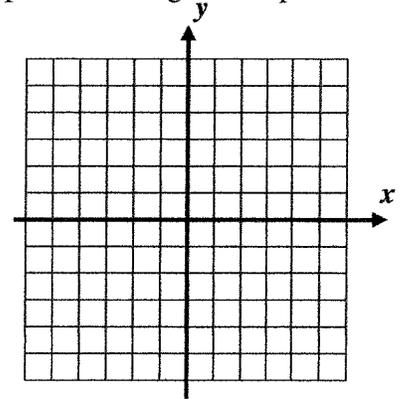
(2) -17

(4) 3

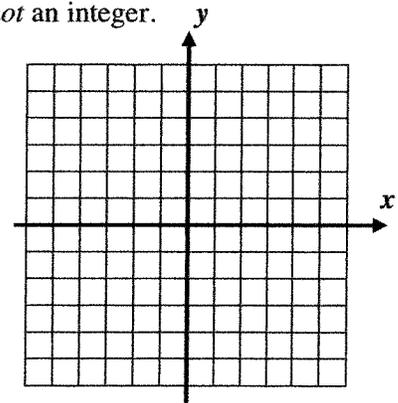
6. Which of the following lines is parallel to the line $y = -3x + 4$ and has a y-intercept of 10?

- (1) $y = 4x + 10$ (3) $y = -3x + 10$
(2) $y = -3x - 10$ (4) $y = 4x + 4$

7. Write the equation of the line, in $y = mx + b$ form, that passes through the points $(-4, -3)$ and $(2, 6)$. The use of the grid is optional.



8. Write the equation of the line, in $y = mx + b$ form, that passes through the points $(-1, 4)$ and $(3, 2)$. The use of the grid is optional. Beware, the y-intercept of this line is *not* an integer.



9. Write the equations of the lines that are parallel to the line $2y = 4x + 6$ and pass through the following points.

- (a) $(0, 7)$ (b) $(5, 6)$

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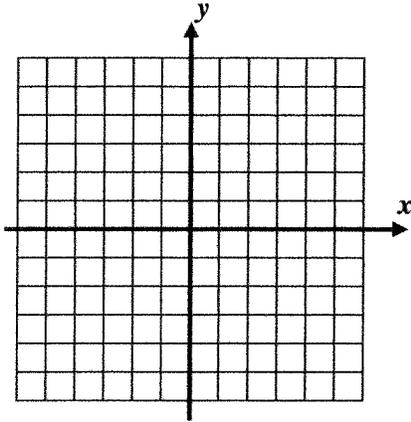
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Graphing Lines Algebra 1

We now know the importance of the slope of a line. It gives us both how steep the line is and whether the line increases or decreases. Given the slope and a single point on a line, we can find all other points that lie on it as well. The next exercise will illustrate this concept.

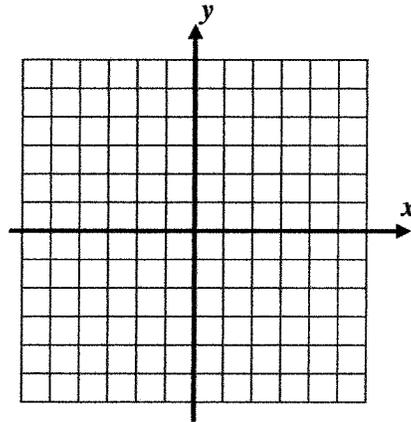
Exercise #1: For each part of this problem, the slope of a line is given along with a point through which the line passes. Graph the line and write its equation in $y = mx + b$ form.

(a) $m = \frac{1}{2}$ and $(-4, 2)$



EQUATION: _____

(b) $m = -\frac{3}{2}$ and $(-2, 1)$



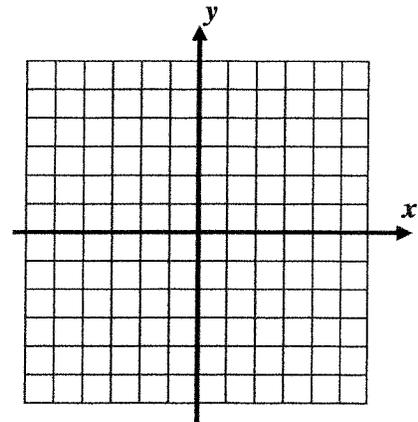
EQUATION: _____

We see from this example that if we know a single point on a line and the line's slope, we can quickly graph the line. One point that is easily determined from its equation comes from the y-intercept.

Exercise #2: Consider the linear equation $y = \frac{1}{3}x - 1$.

(a) State the slope and the y-intercept of this line.

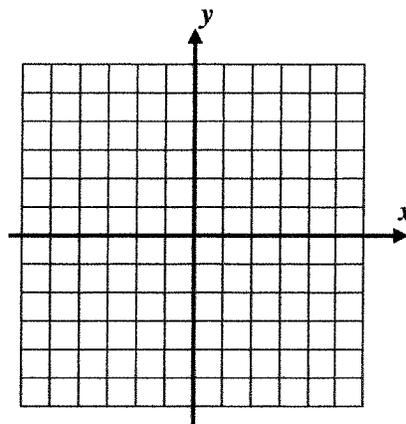
(b) Use the slope and the y-intercept to graph the line to the right.



Keep in mind that, in general, we can **always** create a table of values, either by hand or in our calculator, to graph any line. Using the slope and the y -intercept is a quick way to graph many lines. Of course, the key in using these is to have the equation of the line in its $y = mx + b$ form.

Exercise #3: Consider the linear function $3y - 2x = -6$.

(a) Place this equation in $y = mx + b$ form.

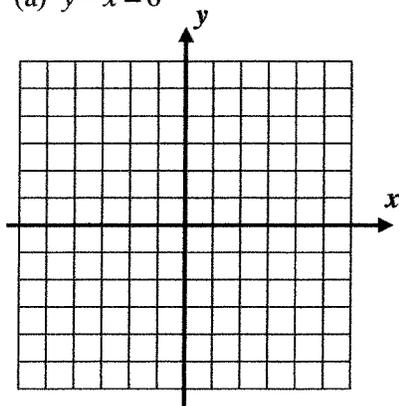


(b) Graph the equation on the grid to the right.

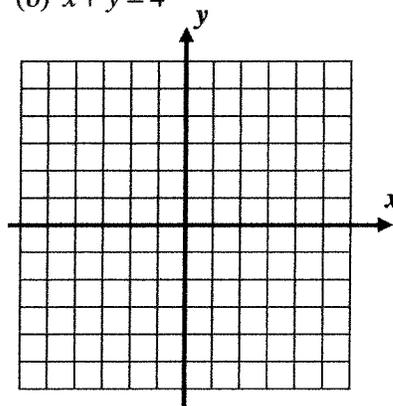
(c) Does the point $(-36, -22)$ lie on this line? Justify.

Exercise #4: For each of the following, rearrange into $y = mx + b$ form and then graph.

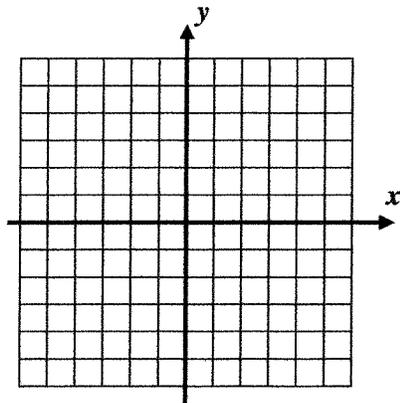
(a) $y - x = 0$



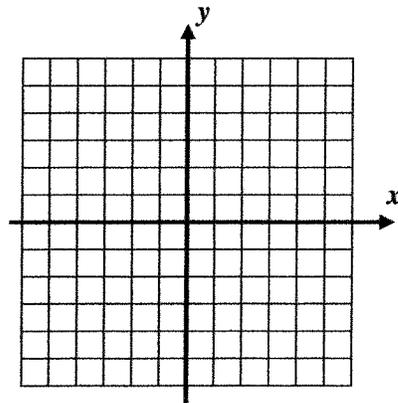
(b) $x + y = 4$



(c) $3x - 4y = -4$



(d) $x + 2y = 8$



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Graphing Lines Algebra 1 Homework

Skills

1. Which of the following is true of the line whose equation is $2y + 3x = 8$?

- (1) It has a slope of 3 and a y-intercept of 8.
- (2) It has a slope of $\frac{3}{2}$ and a y-intercept of 8.
- (3) It has a slope of $-\frac{3}{2}$ and a y-intercept of 4.
- (4) It has a slope of $\frac{3}{2}$ and a y-intercept of 4.

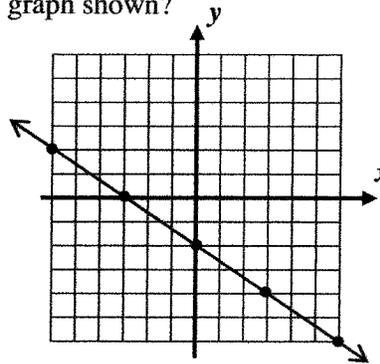
2. Which of the following equations represents the graph shown?

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

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

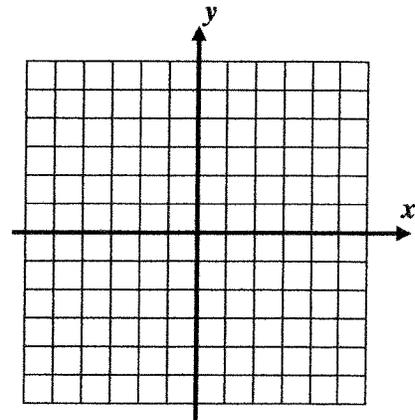
(2) $y = -\frac{3}{2}x - 2$

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



3. Consider the linear function $y = \frac{1}{2}x - 1$.

(a) Graph this line on the grid using its slope and y-intercept.



(b) None of the following points, when plotted, would fit on this particular grid, but that doesn't mean they don't lie on the line (it extends forever in both directions). Determine which points lie on the line and which do not.

(30, 14)

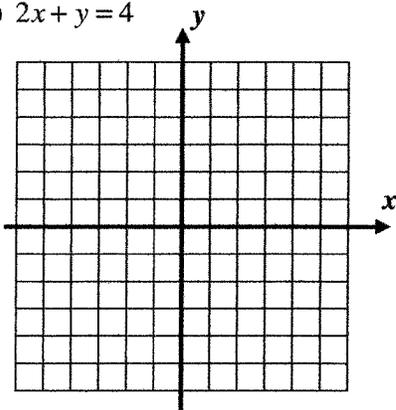
(70, 28)

(-30, -15)

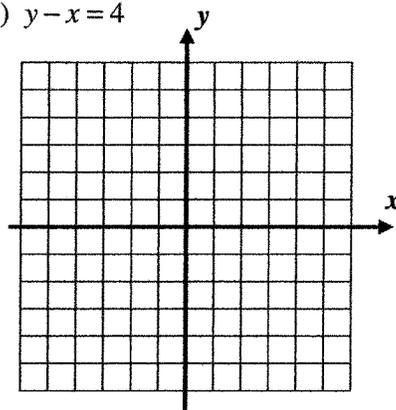
(-50, -26)

4. For each of the following linear equations, rearrange into $y = mx + b$ form and then graph on the grid.

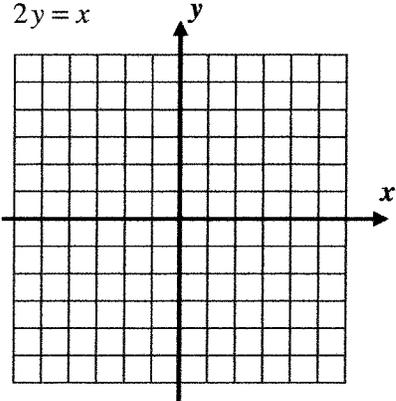
(a) $2x + y = 4$



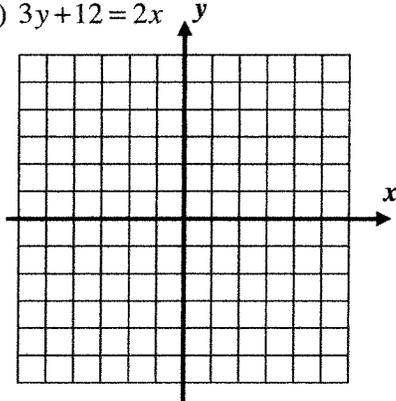
(b) $y - x = 4$



(c) $2y = x$



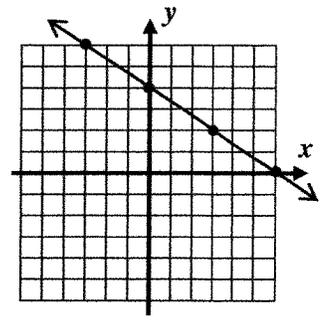
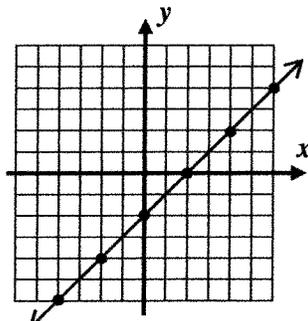
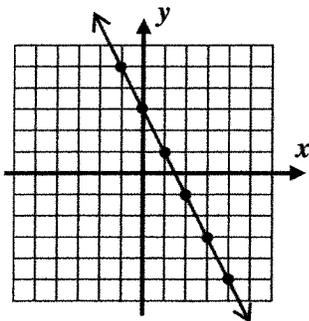
(d) $3y + 12 = 2x$



Reasoning

5. Consider the three linear graphs shown below as you answer the following:

- State the **coordinates** of the point for each graph's intersection with the y-axis.
- State the y-intercept for each graph.
- To determine the y-intercept algebraically, what number must be substituted for x ?

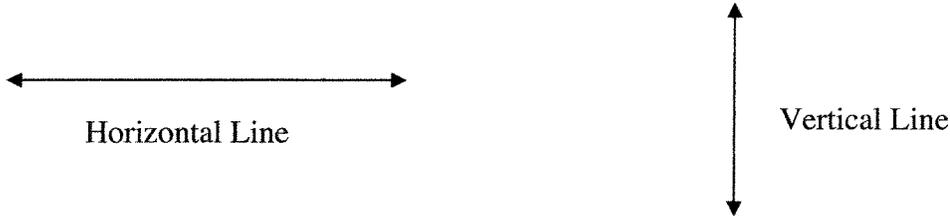


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Horizontal and Vertical Lines Algebra 1

There are two types of lines that are slightly different from the typical slant line. These lines are horizontal, parallel to the x -axis, and vertical, parallel to the y -axis.



Exercise #1: The line $y = 3$ is graphed on the grid at the right.

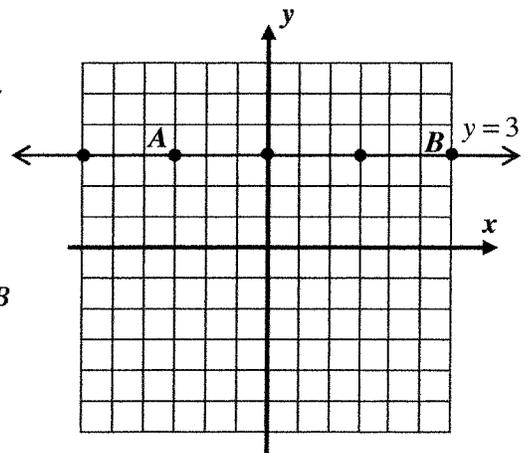
(a) Graph and label the lines $y = 5$ and $y = -2$ on the same grid.

(b) State the coordinates of point A and B from the line $y = 3$.

(c) If it exists, find the slope of the line connecting points A and B from above.

(d) If it exists, find the y -intercept of the line connecting points A and B .

(d) Write the equation of the line connecting A and B in $y = mx + b$ form.



EQUATIONS OF HORIZONTAL LINES

$$y = mx + b \text{ where } m = 0 \text{ (or simply } y = b)$$

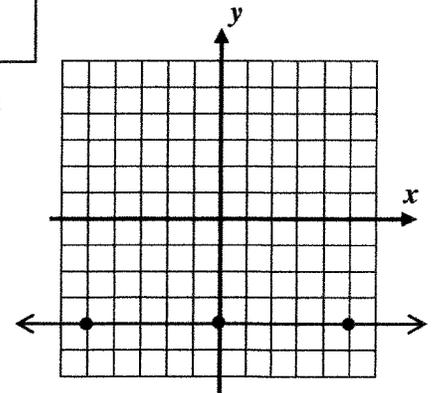
Exercise #2: Which of the following represents the equation of the graph shown at the right?

(1) $x = -4$

(3) $y = -4x$

(2) $y = x - 4$

(4) $y = -4$



Exercise #3: The line $x = 2$ is graphed on the grid at the right.

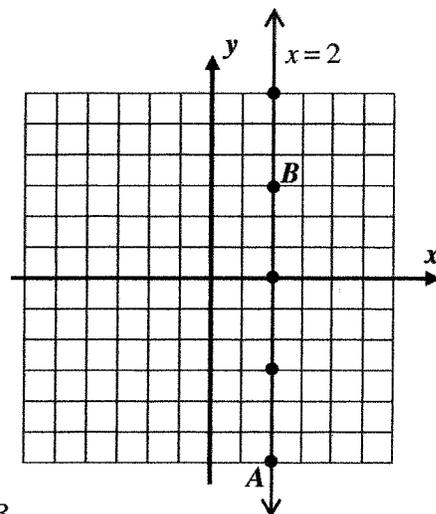
(a) Graph and label the lines $x = 4$ and $x = -3$ on the same grid.

(b) State the coordinates of point A and B from the line $x = 2$.

(c) If it exists, find the slope of the line connecting points A and B from above.

(d) If it exists, find the y -intercept of the line connecting points A and B .

(e) Why is it not possible to write the equation of a vertical line in $y = mx + b$ form?



EQUATIONS OF VERTICAL LINES

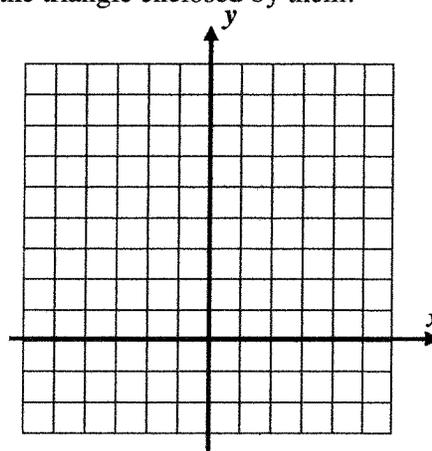
$x = a$ where a is the x -intercept of the line

Exercise #4 Graph the following three lines and find the area of the triangle enclosed by them.

$x = 5$

$y = -3$

$y = 2x - 1$



Exercise #5 Create a rough sketch and then write the equation of the line that fits each description:

(a) parallel to the x -axis passing through $(3, 2)$

(b) parallel to the y -axis passing through $(-4, 3)$

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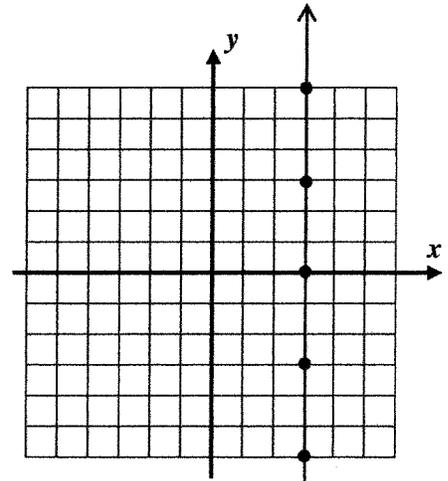
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Horizontal and Vertical Lines Algebra 1 Homework

Skills

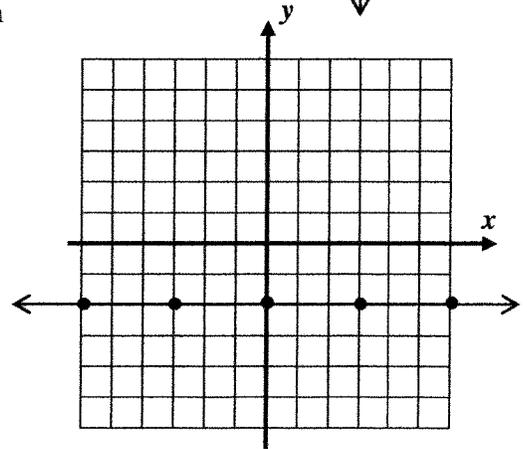
1. Which of the following equations represents the line shown in the graph to the right?

- (1) $y = 3$ (2) $x = 3$
(3) $y = 3x$ (4) $x = 3y$



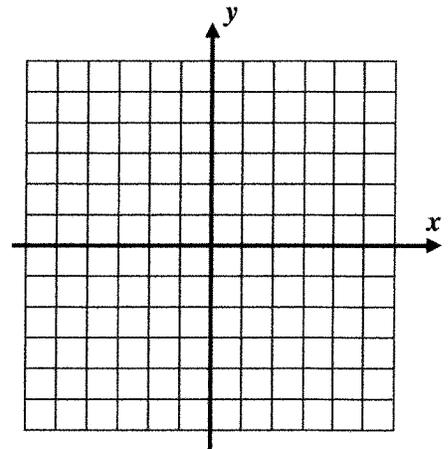
2. Which of the following equations represents the line shown in the graph to the right?

- (1) $y = -2$ (2) $y = -2x$
(3) $x = -2$ (4) $y = x - 2$



3. Graph and **label** the following two lines. Write the coordinates of their intersection point.

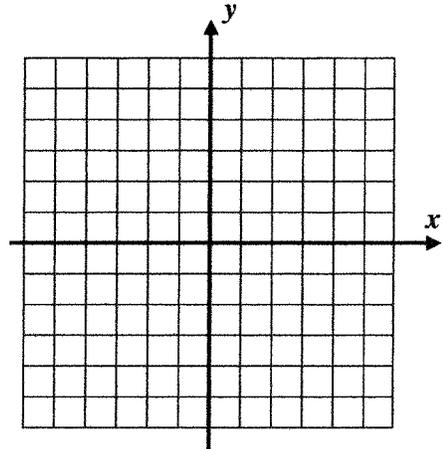
$x = -5$ $y = 4$



4. Graph and label the following vertical and horizontal lines. Then, determine the area of the rectangle enclosed by the lines.

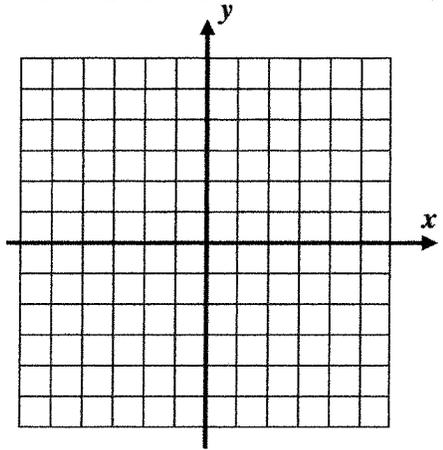
$$x = -2 \qquad x = 4$$

$$y = -3 \qquad y = 5$$



5. Graph and label the following lines. Then, determine the area of the triangle enclosed by the lines. Remember to solve for y in the equation of the slant line to use your graphing calculator to set up a table.

$$x = 3 \qquad y = -2 \qquad 3y - 2x = 6$$



6. Which of the following represents the equation of the x -axis?

- (1) $x = 1$ (3) $y = 0$
 (2) $y = 1$ (4) $x = 0$

7. Which of the following represents the equation of a line that is parallel to the y -axis and passes through the point $(1, 4)$?

- (1) $x = 1$ (3) $y = 4$
 (2) $x = 4$ (4) $y = 1$

8. Which of the following equations represents a line that is parallel to the x -axis and passes through the point $(3, -5)$?

- (1) $x = 3$ (3) $y = 3$
 (2) $x = -5$ (4) $y = -5$
