

## 5.3 GRAPHING LINEAR RELATIONS

Name: \_\_\_\_\_

Block \_\_\_\_\_

### Review

Relation –

*Example:*

### A) GRAPHING LINEAR EQUATIONS: METHOD 1-TABLE OF VALUES

You can graph a linear relation by building a table of values and graphing the ordered pairs from the table. It helps to know the “rate of change” (or the slope).

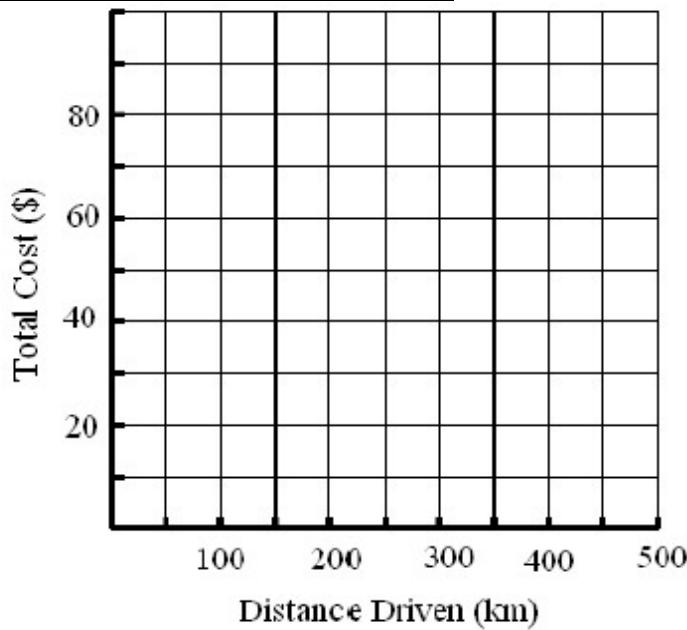
**Example #1:** Crothall Car Rental charges customers \$20 per day, plus \$0.10 for each kilometre driven.

a) Complete the table of values.

| Number of kilometres driven(n) | Total Cost (C) |
|--------------------------------|----------------|
| 0                              |                |
| 100                            |                |
| 200                            |                |
| 300                            |                |

b) Write an equation for cost:

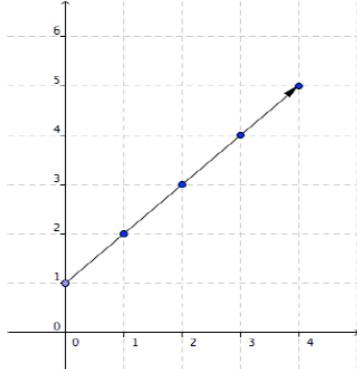
$$C = \underline{\hspace{2cm}}$$



# PRACTICE

Complete the table of values from the given linear relation.

154.



A. Complete the table of values.

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

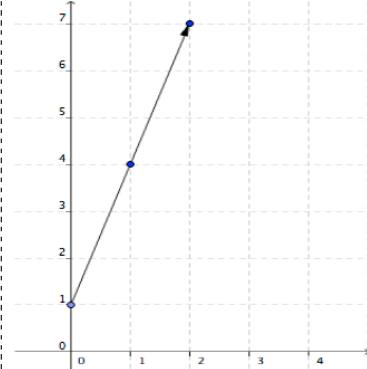
B. Write an equation to represent the table of values?

Y is one more than x. Therefore  $y = x + 1$

C. How can the equation be used to determine where the line crosses the y-axis(y-intercept)?

The 1 from  $y = x + 1$  is where it the graph crosses the y-axis.

155.



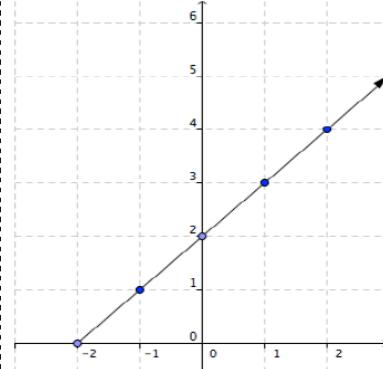
A. Complete the table of values.

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

B. Write an equation to represent the table of values?

C. How can the equation be used to determine the y-intercept?

156.



A. Complete the table of values.

| x | y |
|---|---|
| 0 |   |
| 1 |   |
| 2 |   |
| 3 |   |

B. Write an equation to represent the table of values?

C. How can the equation be used to determine the rate of change?

**Complete the following table of values:** use the formula provided, and substitute x-values

1)

$$y = 6x$$

| x  | y |
|----|---|
| 2  |   |
| 7  |   |
| -2 |   |
| -8 |   |
| 0  |   |

5)

$$y = -5x + 8$$

| x  | y |
|----|---|
| -5 |   |
| -8 |   |
| 4  |   |
| 0  |   |
| 2  |   |

2)

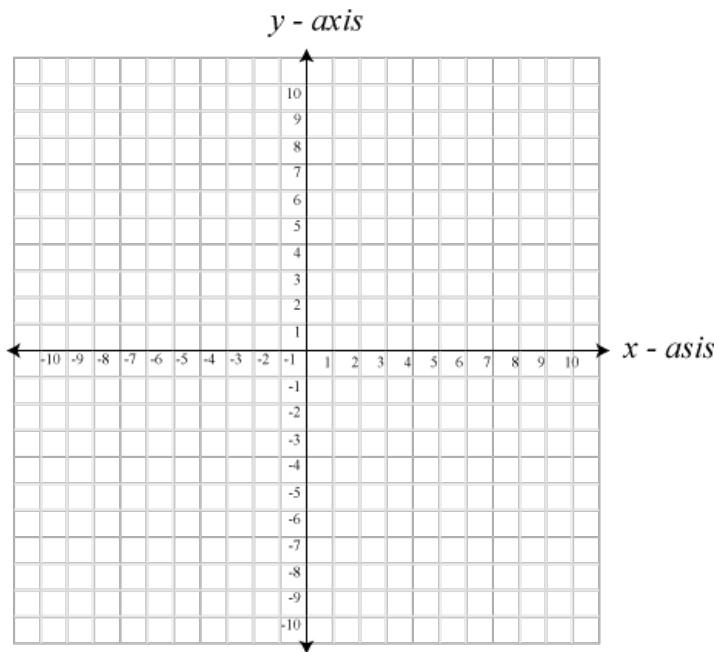
$$y = -4x$$

| x  | y |
|----|---|
| 1  |   |
| 5  |   |
| 8  |   |
| -8 |   |
| 0  |   |

6)

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

| x  | y |
|----|---|
| 6  |   |
| -5 |   |
| -3 |   |
| 1  |   |
| 7  |   |



# Remember!

## Linear Relation

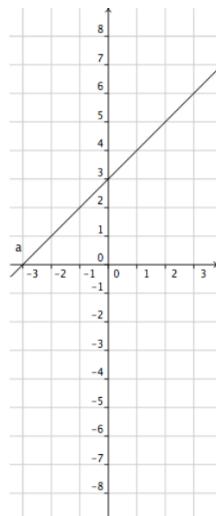
- A linear relation when graphed forms a straight line.
- Or a straight line can be drawn through every point of the graph.
- A linear relation has a constant rate of change.

Which of the following are linear relations?

80.  $y = x + 3$

| x  | y |
|----|---|
| -2 | 1 |
| -1 | 2 |
| 0  | 3 |
| 1  | 4 |
| 2  | 5 |

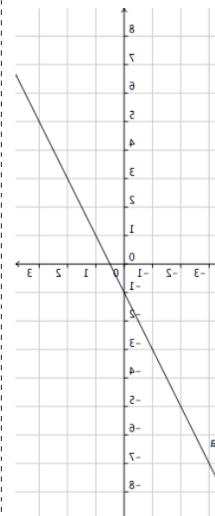
Rate of change?



81.  $y = 2x - 1$

| x  | y  |
|----|----|
| -2 | -5 |
| -1 | -3 |
| 0  | -1 |
| 1  | 1  |
| 2  | 3  |

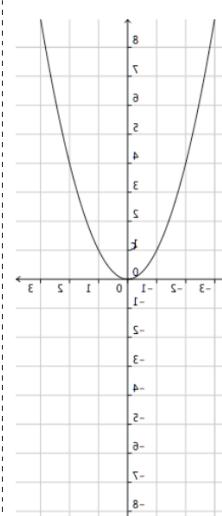
Rate of change?



82.  $y = x^2$

| x  | y |
|----|---|
| 2  | 4 |
| 1  | 1 |
| 0  | 0 |
| -1 | 1 |
| -2 | 4 |

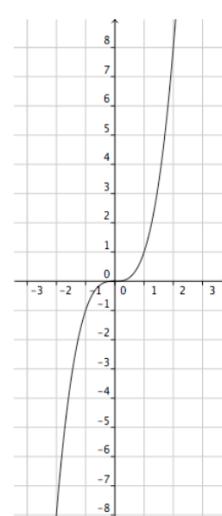
Rate of change?



83.  $y = x^3$

| x  | y  |
|----|----|
| 2  | 8  |
| 1  | 1  |
| 0  | 0  |
| -1 | -1 |
| -2 | 8  |

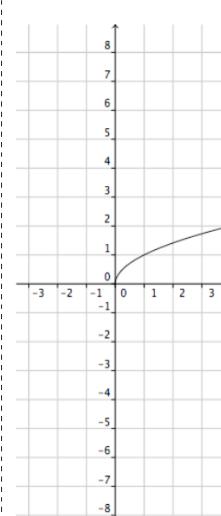
Rate of change?



84.  $y = \sqrt{x}$

| x  | y |
|----|---|
| 4  | 2 |
| 1  | 1 |
| 0  | 0 |
| -1 | ∅ |
| -2 | ∅ |

Rate of change?

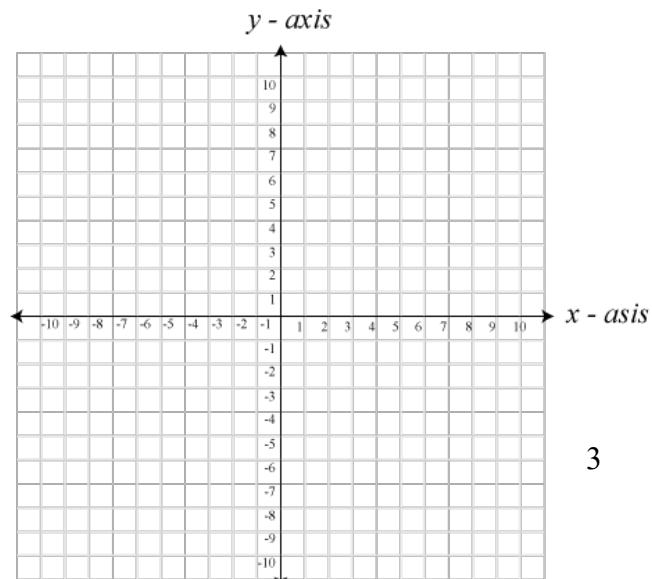


"Rate of Change" and "the Slope of a line" mean the same thing

## B) SLOPE OF A LINE

Determine the "Rate of Change" for the following table of values:

| x  | y  |
|----|----|
| 5  | 5  |
| 7  | 3  |
| 9  | 1  |
| 11 | -1 |



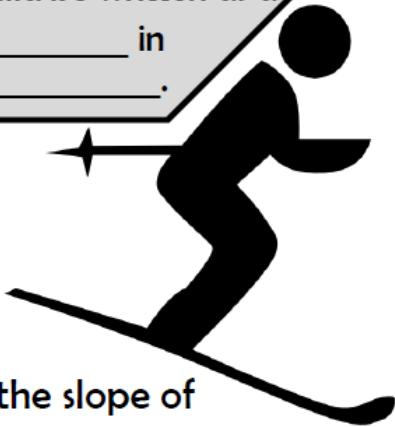
Name:

Slope (vertical change over horizontal change) is represented by the letter "m."

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

$$m = \underline{\hspace{100pt}}$$

Slope represents the  
**Rate of Change**.  
Slope should be written as a  
\_\_\_\_\_ in  
\_\_\_\_\_.



Find the slope of  
each line below.

**S**  
**L**  
**O**  
**P**  
**E**

The slope  
of a  
horizontal  
line is \_\_\_\_\_.

The slope of a  
vertical line is  
\_\_\_\_\_.

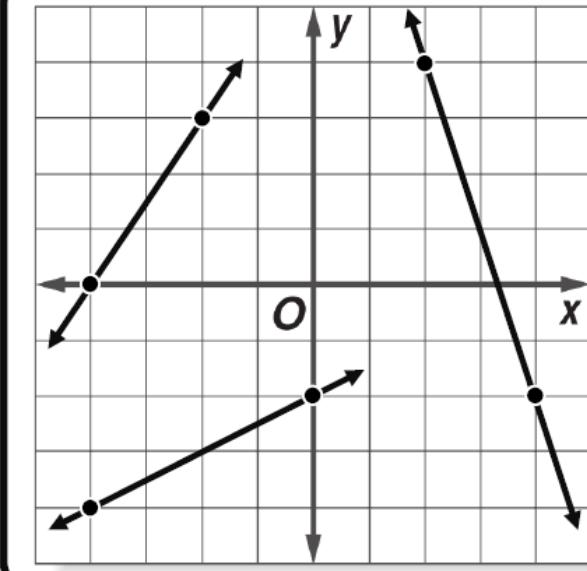
Remember:  
UP and RIGHT are  
\_\_\_\_\_ movements;  
DOWN and LEFT are  
\_\_\_\_\_ movements.

The slope of a line can be determined from a table, by \_\_\_\_\_ units on a coordinate plane, or by \_\_\_\_\_ coordinates.

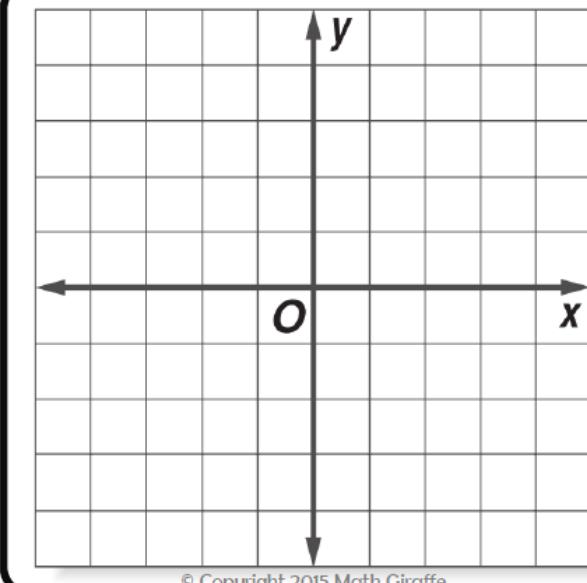
Find the slope between  
the two points.

1. (3, -2) and (4, 4)

2. (6, 0) and (-8, -1)



Plot a line that  
starts at the  
origin and has  
a slope of  
-3. Label  
it "a."



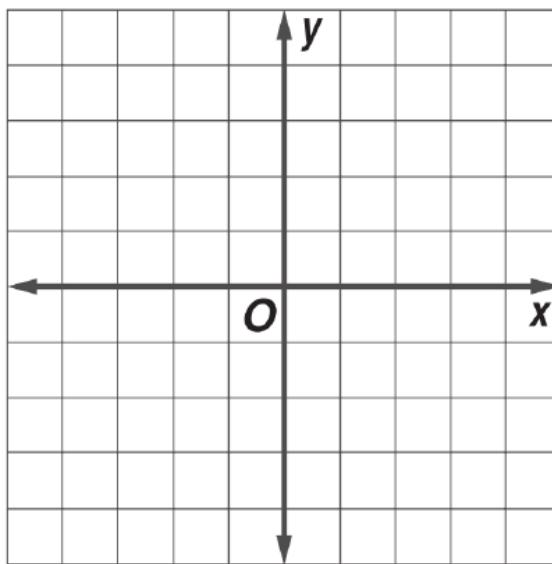
Plot a line  
that starts at  
(0, 4) and  
has a slope  
of  $-\frac{3}{4}$ .  
Label  
it "b."

Steeper slopes have greater \_\_\_\_\_.

**STEEP**

Name: \_\_\_\_\_

**try-it**



Graph four different lines, all with different negative slopes. Show each slope and compare steepness.

Slopes will be represented with fractions with a greater



Sketch a sample (or a few) of each type of slope. Add a skier if you want! It may help you remember the direction and whether the values are increasing or decreasing.

**Sketch it**



Positive  
slope



Negative  
slope



Zero  
slope



Undefined  
slope

Order from Steepest to Least Steep:  $\frac{1}{3}, 3, \frac{3}{2}, \frac{3}{4}$

Name \_\_\_\_\_

Date \_\_\_\_\_

# EXTREME SPORTS



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

**Directions:** Find the slope of the line given a pair of points, a table, a graph or a verbal situation. Write your answer in the box below the problem number.

|          |                     |                   |        |                    |
|----------|---------------------|-------------------|--------|--------------------|
| <b>1</b> | (20, -3), (19, -20) |                   |        |                    |
|          | A. 17               | B. $\frac{1}{17}$ | C. -17 | D. $-\frac{1}{17}$ |

|          |                   |                  |                   |                  |
|----------|-------------------|------------------|-------------------|------------------|
| <b>2</b> | (-5, 11), (0, 7)  |                  |                   |                  |
|          | A. $-\frac{5}{4}$ | B. $\frac{5}{4}$ | C. $-\frac{4}{5}$ | D. $\frac{4}{5}$ |

|          |                   |      |       |      |
|----------|-------------------|------|-------|------|
| <b>3</b> | (-20, 9), (14, 9) |      |       |      |
|          | A. undefined      | B. 3 | C. -3 | D. 0 |

|          |                    |                  |                   |      |
|----------|--------------------|------------------|-------------------|------|
| <b>4</b> | (12, -1), (-2, -3) |                  |                   |      |
|          | A. -7              | B. $\frac{1}{7}$ | C. $-\frac{1}{7}$ | D. 7 |

|          |                   |                  |                   |       |
|----------|-------------------|------------------|-------------------|-------|
| <b>5</b> | (-3, 15), (9, 17) |                  |                   |       |
|          | A. 6              | B. $\frac{1}{6}$ | C. $-\frac{1}{6}$ | D. -6 |

|          |                   |                   |       |      |
|----------|-------------------|-------------------|-------|------|
| <b>6</b> | (7, -11), (16, 7) |                   |       |      |
|          | A. $\frac{1}{2}$  | B. $-\frac{1}{2}$ | C. -2 | D. 2 |

|          |                     |      |       |      |
|----------|---------------------|------|-------|------|
| <b>7</b> | (-1, -16), (-1, 11) |      |       |      |
|          | A. undefined        | B. 1 | C. -1 | D. 0 |

|          |                    |                   |                  |      |
|----------|--------------------|-------------------|------------------|------|
| <b>8</b> | (-2, -7), (3, -10) |                   |                  |      |
|          | A. -3              | B. $-\frac{3}{5}$ | C. $\frac{3}{5}$ | D. 5 |

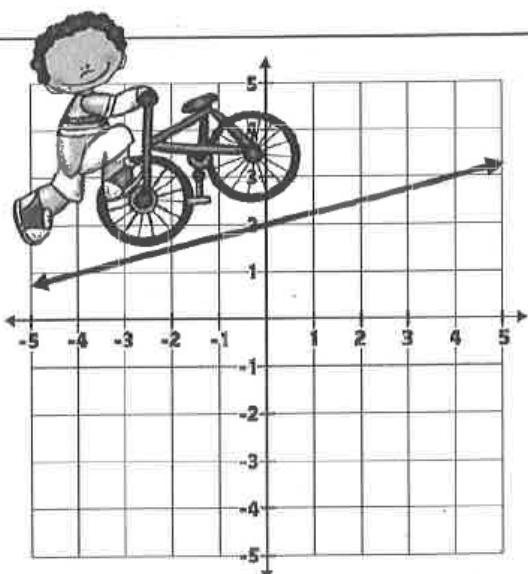
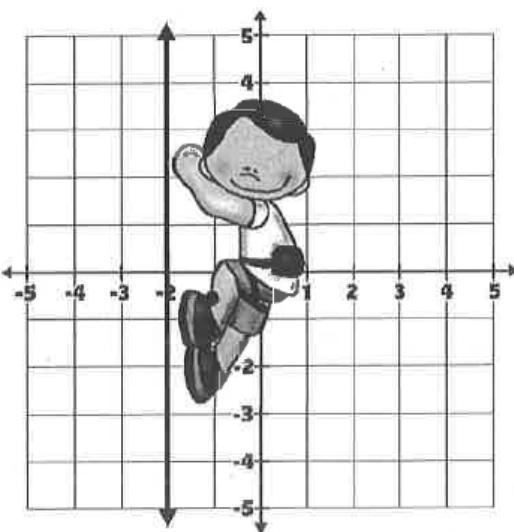
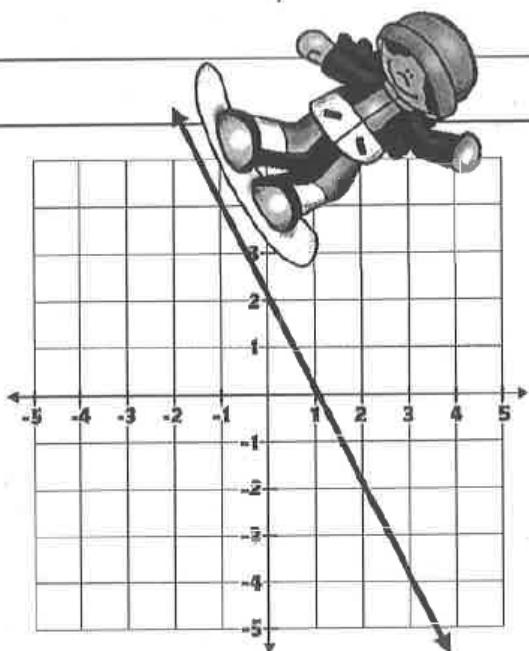
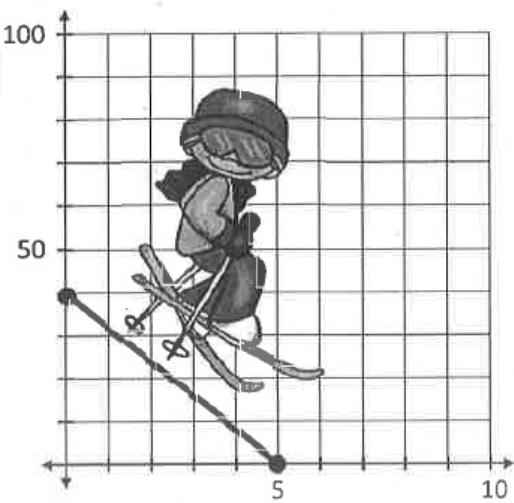
|          |  |    |   |   |  |   |    |   |   |   |   |    |    |   |   |
|----------|--|----|---|---|--|---|----|---|---|---|---|----|----|---|---|
| <b>9</b> | <table border="1"> <tr> <td>x</td><td>-8</td><td>0</td><td>4</td><td>8</td></tr> <tr> <td>y</td><td>-7</td><td>-1</td><td>2</td><td>5</td></tr> </table> |    |   |   |  | x | -8 | 0 | 4 | 8 | y | -7 | -1 | 2 | 5 |
| x        | -8   | 0  | 4 | 8 |  |   |    |   |   |   |   |    |    |   |   |
| y        | -7   | -1 | 2 | 5 |  |   |    |   |   |   |   |    |    |   |   |



|           |  |    |    |    |  |   |    |   |   |   |   |    |    |    |    |
|-----------|--|----|----|----|--|---|----|---|---|---|---|----|----|----|----|
| <b>10</b> | <table border="1"> <tr> <td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr> <tr> <td>y</td><td>19</td><td>17</td><td>15</td><td>13</td></tr> </table> |    |    |    |  | x | -1 | 0 | 1 | 2 | y | 19 | 17 | 15 | 13 |
| x         | -1   | 0  | 1  | 2  |  |   |    |   |   |   |   |    |    |    |    |
| y         | 19   | 17 | 15 | 13 |  |   |    |   |   |   |   |    |    |    |    |

|           |  |  |   |   |   |   |   |   |    |   |    |   |
|-----------|--|--|---|---|---|---|---|---|----|---|----|---|
| <b>11</b> | <table border="1"> <tr> <td>x</td><td>y</td></tr> <tr> <td>0</td><td>6</td></tr> <tr> <td>5</td><td>5</td></tr> <tr> <td>10</td><td>4</td></tr> <tr> <td>15</td><td>3</td></tr> </table> |  | x | y | 0 | 6 | 5 | 5 | 10 | 4 | 15 | 3 |
| x         | y  |  |   |   |   |   |   |   |    |   |    |   |
| 0         | 6  |  |   |   |   |   |   |   |    |   |    |   |
| 5         | 5  |  |   |   |   |   |   |   |    |   |    |   |
| 10        | 4  |  |   |   |   |   |   |   |    |   |    |   |
| 15        | 3  |  |   |   |   |   |   |   |    |   |    |   |

|           |   |  |   |   |    |     |    |     |    |    |   |    |
|-----------|---|--|---|---|----|-----|----|-----|----|----|---|----|
| <b>12</b> | <table border="1"> <tr> <td>x</td><td>y</td></tr> <tr> <td>-6</td><td>-27</td></tr> <tr> <td>-5</td><td>-23</td></tr> <tr> <td>-1</td><td>-7</td></tr> <tr> <td>0</td><td>-3</td></tr> </table> |  | x | y | -6 | -27 | -5 | -23 | -1 | -7 | 0 | -3 |
| x         | y   |  |   |   |    |     |    |     |    |    |   |    |
| -6        | -27   |  |   |   |    |     |    |     |    |    |   |    |
| -5        | -23   |  |   |   |    |     |    |     |    |    |   |    |
| -1        | -7  |  |   |   |    |     |    |     |    |    |   |    |
| 0         | -3  |  |   |   |    |     |    |     |    |    |   |    |

**13****14****15****16****17**

The water level in Noah's water tank is 72 inches high. Noah begins to drain a water tank by opening a valve. The water drains at the speed of 5 inches per minute.

**18**

A pet store is selling puppies for \$50 each plus a \$14.99 transfer fee.

**19**

A small bookstore is selling copies of the book *To Kill a Mockingbird* for \$6.99 each plus \$0.99 for shipping and handling.

**20**

To rent movies from the store, a person has to pay an annual membership fee of \$20 plus \$2.50 for each movie rented.

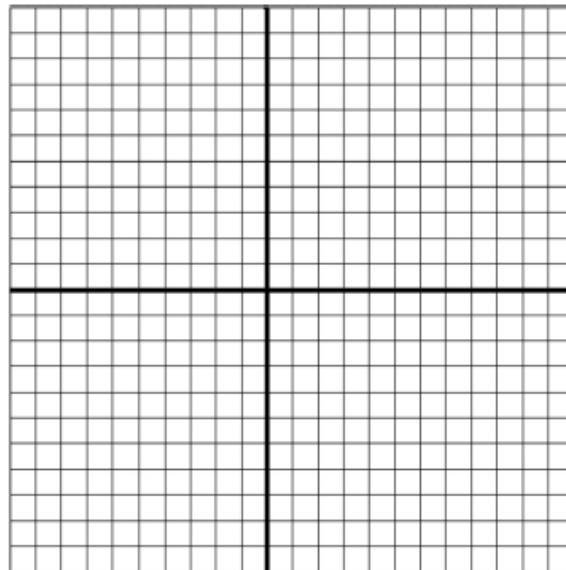
**Example #2:** Graph the linear relation  $y = 2x - 4$  using a table of values.

e) In this example, the \_\_\_\_\_ depends on the \_\_\_\_\_

Dependent Variable  
(Vertical Axis)

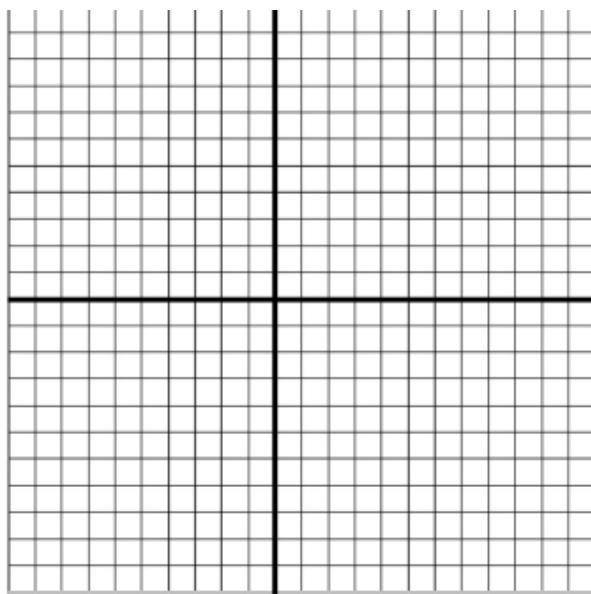
Independent Variable  
(Horizontal Axis)

| <b>x</b> | <b>y</b> |
|----------|----------|
| -1       |          |
| 0        |          |
| 1        |          |
| 2        |          |
| 3        |          |



Graph  $y = 6 - 3x$  using a table of values.

| <b>x</b> | <b>y</b> |
|----------|----------|
|          |          |
|          |          |
|          |          |
|          |          |



Using your graph estimate the value of  $y$  if  $x = 4$ : \_\_\_\_\_      value of  $x$  if  $y = 3$ : \_\_\_\_\_

**Example #3:** The Reynolds student council is planning to hold a dance. The profit in dollars is four times the number of students who attend, minus \$200 for the cost of the DJ.

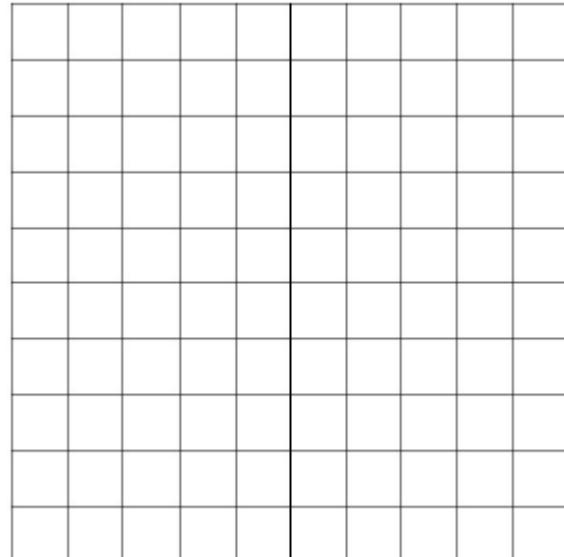
- a) Write an equation that relates the profit ( $P$ ) to the number of students ( $n$ ) who attend.
- 

- b) What is the lowest value of  $n$  that we can include in the table of values?

- c) Create a table of values for this relation

| $n$ | $P$ |
|-----|-----|
|     |     |
|     |     |
|     |     |
|     |     |

- d) Graph the relation using your table of values.



- e) Does it make sense to join the points? Explain.

- f) The independent variable is \_\_\_\_\_;  
the dependent variable is \_\_\_\_\_.

- g) How many students have to attend to make a profit?

Where did you look to find this?

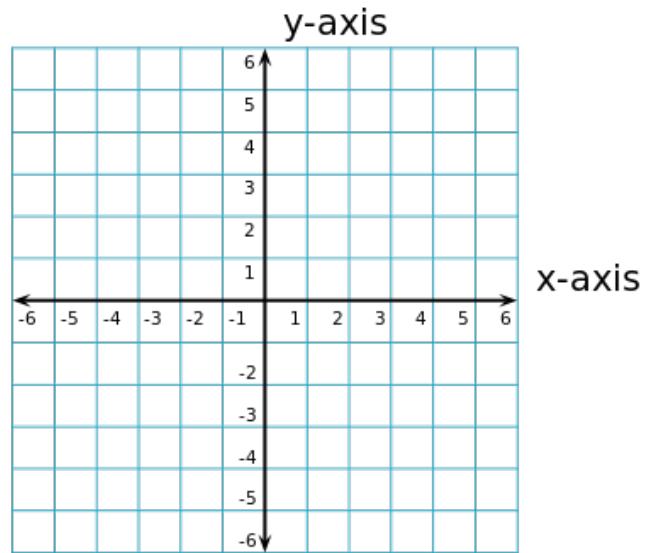
- h) How would the graph be different if the DJ was free?

## C) GRAPHING HORIZONTAL & VERTICAL LINES

Create a graph for each of the following relations:

a)  $y = 4$

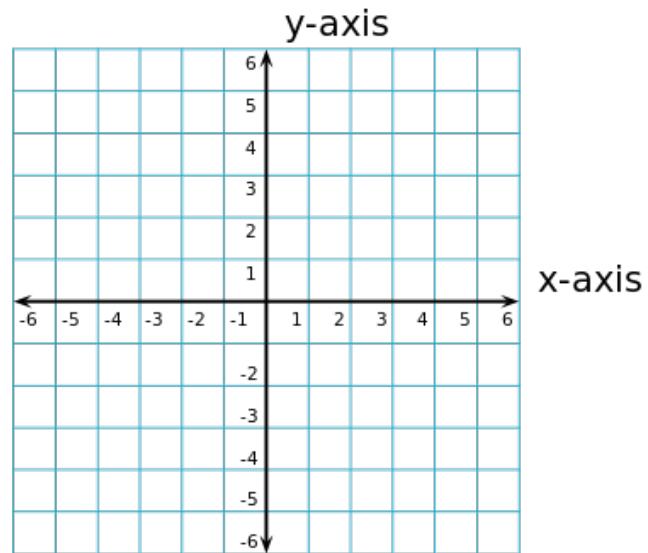
| $x$ | $y$ |
|-----|-----|
|     |     |
|     |     |
|     |     |
|     |     |
|     |     |
|     |     |



The equation of a **horizontal line** has the form \_\_\_\_\_.

b)  $x = 3$

| $x$ | $y$ |
|-----|-----|
|     |     |
|     |     |
|     |     |
|     |     |
|     |     |
|     |     |



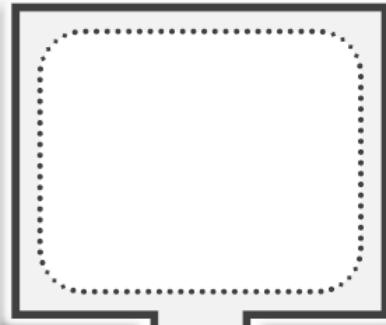
The equation of a **vertical line** has the form \_\_\_\_\_.

The SLOPE is...

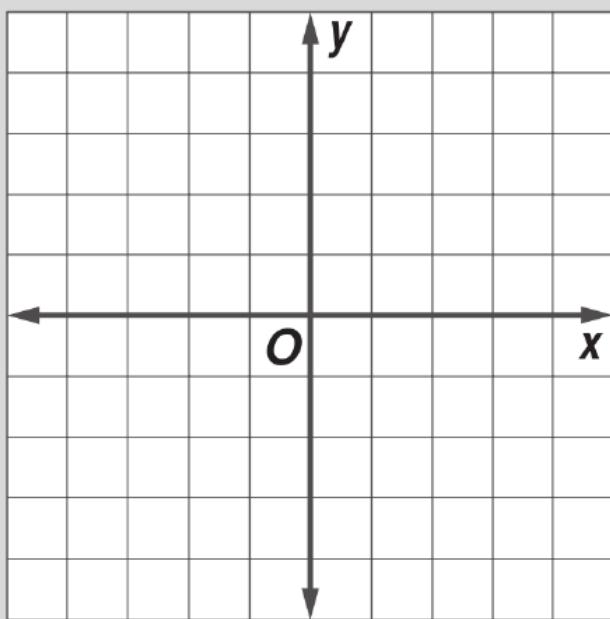
A Y-INTERCEPT  
is...

# Slope- Intercept Form

a formula for  
the equation of a  
line using  
its **slope** and its  
**y-intercept**.



$$y = mx + b$$



## Steps for Graphing

Try graphing  
the line  
 $y = -3x + 2$ .

1

Start by placing  
a point at the

2

From that point, count out the  
to find the next point.

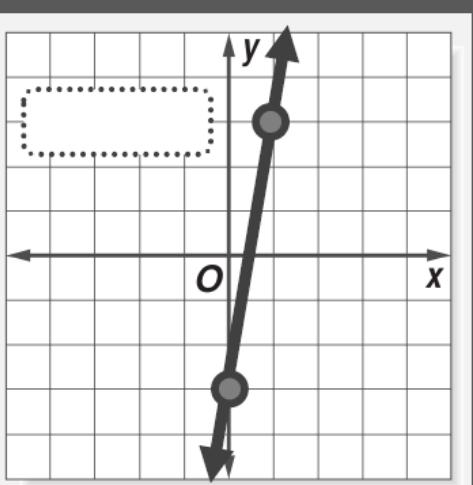
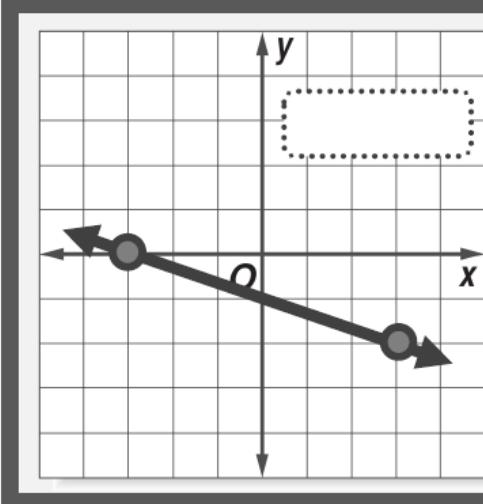
3

Be  
careful  
about ...

# Practise

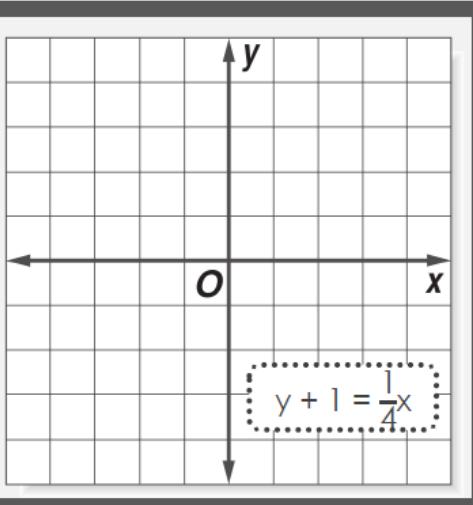
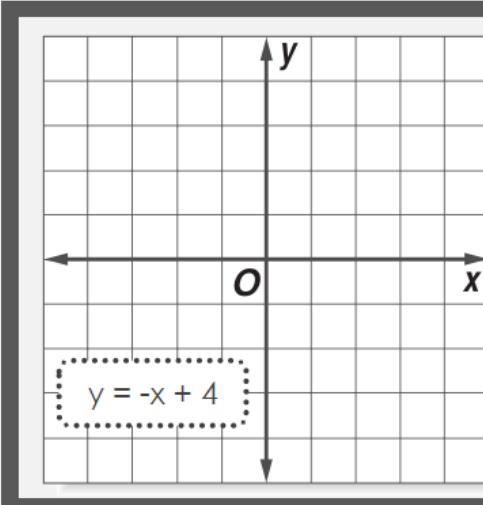
# Using Slope-Intercept Form

Write an equation for each line in slope-intercept form.



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Graph each line.



## Special Cases

$y = 2x$

$y = 4$

## Extra Work

$3y + 5 = 6x$

Identify the slope and y-intercept for each.

A.  $4y - 2x = 8$

B.  $7 = y - x$

C.

|   |    |    |     |
|---|----|----|-----|
| x | -2 | 2  | 6   |
| y | 5  | -3 | -11 |

- D. the line that passes through (3, 3) and (-6, 0)

Name:

## D) GRAPHING: METHOD 2-SLOPE INTERCEPT FORM

You can graph a linear relation represented using the equation of the line in **SLOPE-INTERCEPT FORM**:

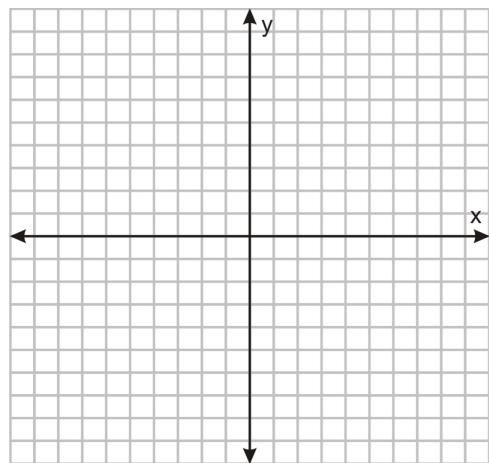
$$y = mx + b$$

### **Example #5:**

Without using a table of values graph the following relation:

$$y = 3x + 2$$

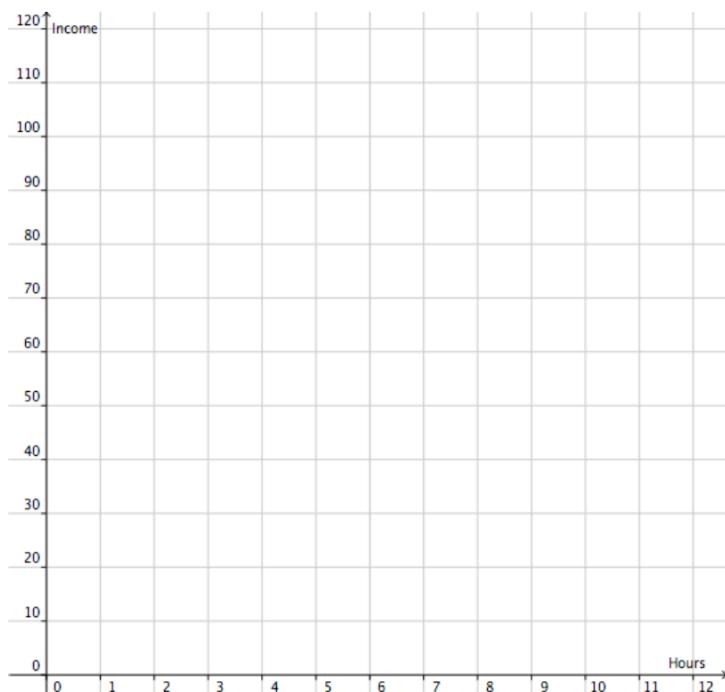
- What is the fixed term?
- What is the rate of change?



### **Challenge #9:** Write an equation, graph a linear relation and solve a problem.

200. Daniel works at a restaurant and currently makes \$10/h. The general manager has just asked him if he would like to take a salary job for \$110 per day.

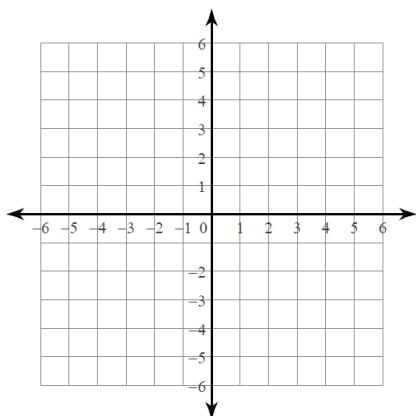
- Write an equation to represent income in terms of hourly pay.
- Write an equation to represent income in terms of salary.
- Graph a linear relation that compares the two income options.
- He decides against the salary position. Was this wise? Explain.



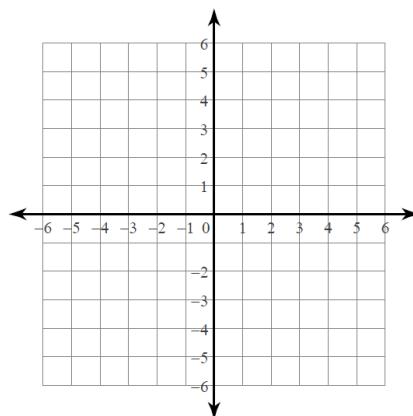
**PRACTICE**

Sketch a graph of each line by identifying the y-intercept & using the slope:

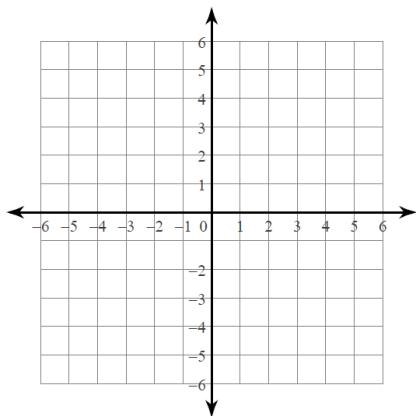
1)  $y = 3x - 4$



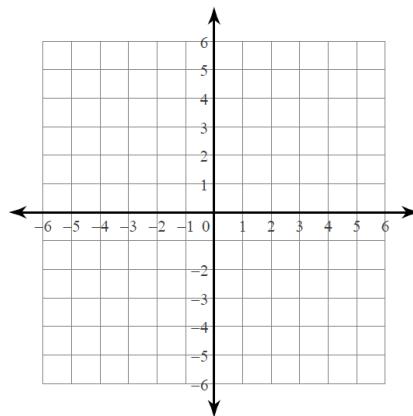
2)  $y = -4x + 1$



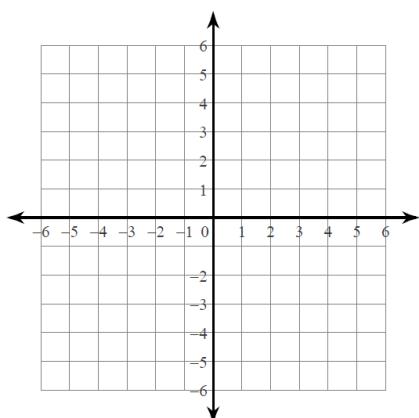
3)  $y = -x$



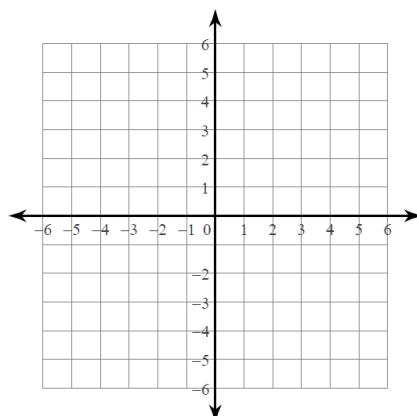
4)  $y = -2x + 2$



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



10)  $y = -x + 3$

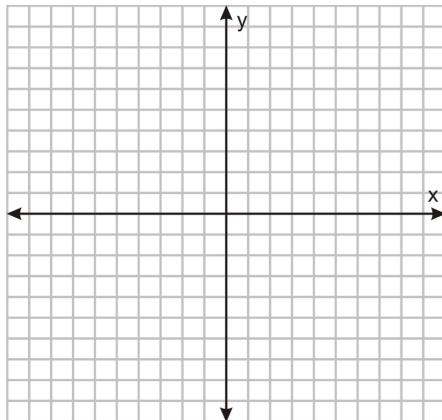


# PRACTICE

Graph the following relations:

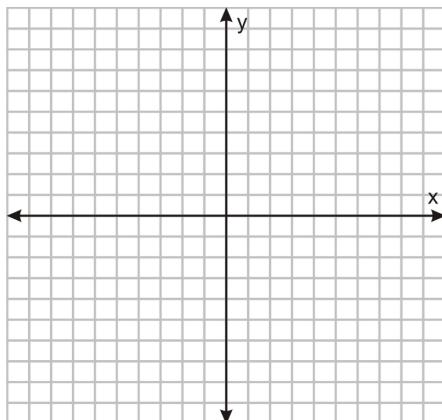
- using the properties of  $y = mx + b$ .
- then check your points with a table of values.

A.  $x = -6$

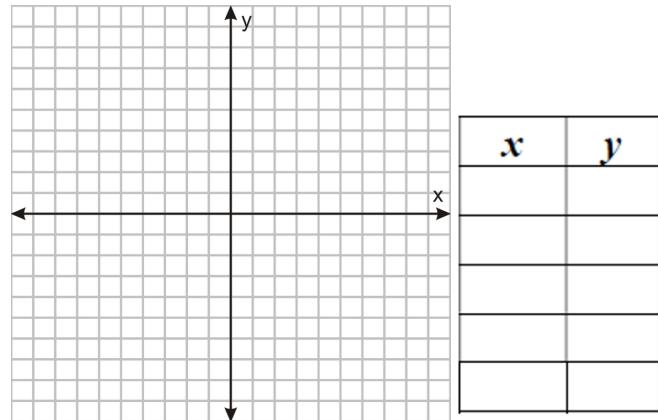


Graph the following relations:

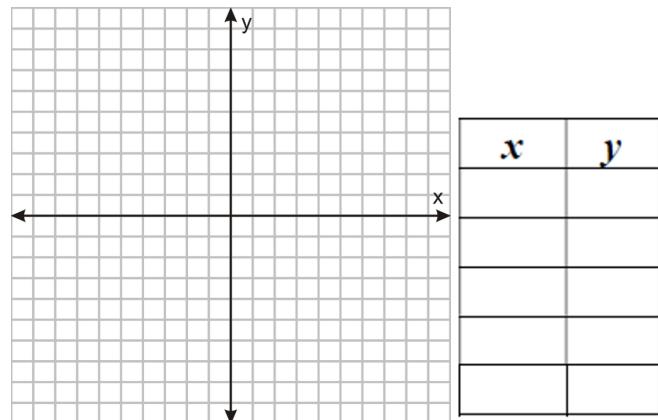
C.  $y = -2$



B.  $y = 5x - 2$



D.  $y = -2x + 4$



Assignment #5.3 pg 185-189

## Required

- 1, 2, 3, 4ace, 5ace,  
7, 8ab, 9, 10, 11,  
12, 15, 18

## Extra Practice

- 4bdf, 5bdf, 6,  
8cd, 13, 14, 16,  
17, 19

## Extension

- 20, 21, 22, 23