Equations of Linear Relations Lesson #6:
Graphing Linear Equations

Graphing Linear Equations Without Technology

Linear equations can be written in different forms:

$$Ax + By + C = 0 \quad \rightarrow \quad \text{General form of a linear equation.}$$

$$y = mx + b \quad \rightarrow \quad \text{Slope } y\text{-intercept form of a linear equation.}$$

$$y - y_1 = m(x - x_1) \quad \rightarrow \quad \text{Point-slope form of a linear equation.}$$

The method used to graph a linear relation without technology depends on the form in which the linear equation is written.
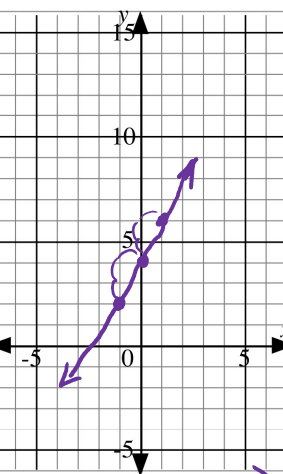
Class Ex. #1 Without altering the form in which the linear equation is written, <u>explain</u> the different strategies used to graph (without technology) each of the following linear relations. Draw the graph of each linear relation on the grid provided.
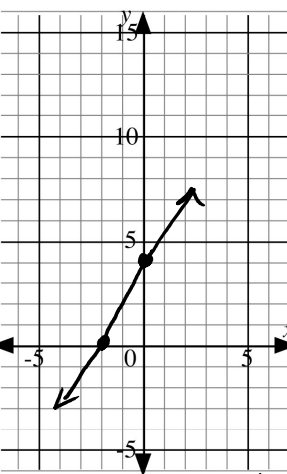
a) $y = 2x + 4$ **b)** $y - 2 = 2(x + 1)$ **c)** $2x - y + 4 = 0$

handwritten notes:
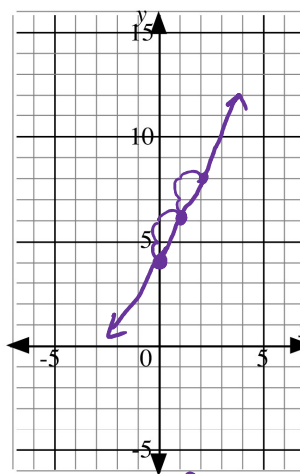
a) y=mx+b form
• plot y-int (0,4)
• use slope rise : 2↑ run 1→
• connect + extend

b) y-y₁ = m(x-x₁)
• plot point (-1,2)
• use slope ↑2 →1
• connect + extend

c) general form - solve for x & y intercepts.

y-int x=0   2(0) - y +4 = 0
            -y + 4 = 0
            y = 4
            (0,4)

x-int, y=0   2x - 0 + 4 = 0
             2x + 4 = 0
(-2,0)   2x = -4
             x = -2
• connect and extend line

Class Ex. #2 Match each linear relation to its graph.

Equation 1:
$2x - y + 3 = 0$

Equation 2:
$y = -2x + 3$

Equation 3:
$y + 1 = -\dfrac{1}{2}(x + 4)$

Equation 4:
$2y - x - 6 = 0$

(handwritten annotations)
Equation 2: $-2 \downarrow$, $\dfrac{-2}{1} \rightarrow$, $(0,3)$
Equation 3: $(-4,-1)$

Graph A *(handwritten: (0,3))*

Graph B *(handwritten: (0,3), (-2,2))*

Graph C

Graph D
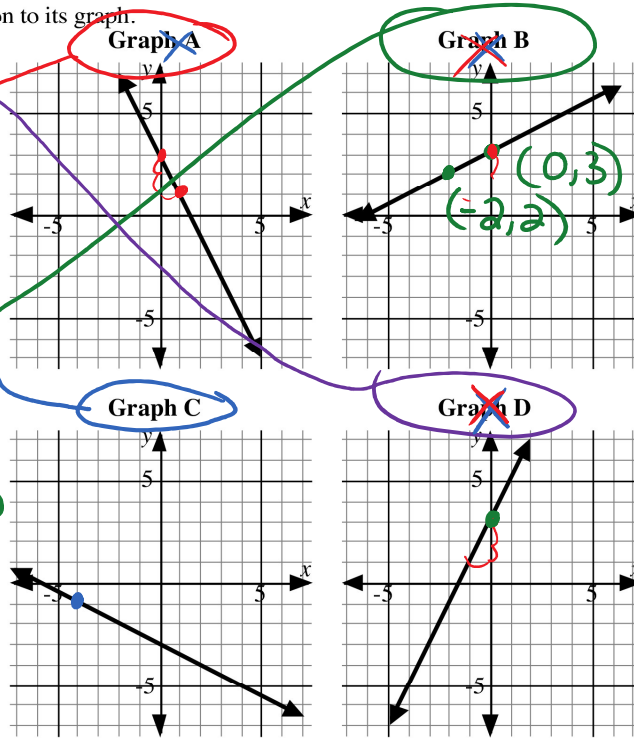
(handwritten work)
Test points on graphs
$2(-2) - 2 + 3 \overset{?}{=} 0$
$-4 - 2 + 3$ ✗
$2(2) - (-2) - 6 \overset{?}{=} 0$
$4 + 2 - 6$ ✓

Class Ex. #3

Graphing Linear Equations With Technology

- <u>Explain</u> the strategy used to graph (with technology) the linear relations.
  $y + 8 = -5(x - 2)$ and $4x - y + 9 = 0$

- State an appropriate window to show x- and y-intercepts, and draw the graph of both linear relations on the same grid.

- Determine the x and y-intercepts of $4x - y + 9 = 0$.
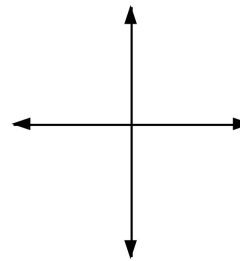
Complete Assignment Questions #1 - #6

Determining Linear Relationships from Tables of Data

Class Ex. #4

Consider the following data points expressed in a table of values

x	2	4	6	8	10
y	−1	0	1	2	3

a) Plot the data points on the grid to verify that there is a linear relationship.

b) Join the points together and determine the slope of the line.

c) Determine the equation of the linear relationship in the form $y = mx + b$.
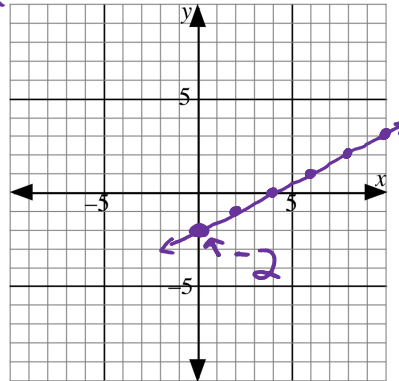
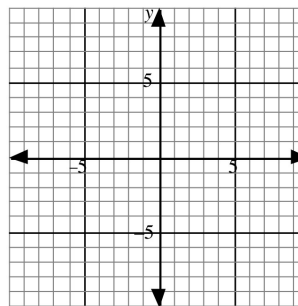$$m = \frac{rise}{run} = \frac{1}{2} \qquad b = -2$$

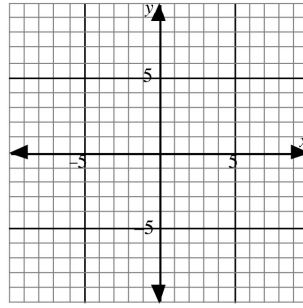$$y = \frac{1}{2}x - 2$$

#1, 2, 4, 5 / 9

Complete Assignment Questions #7 - #10

Assignment

1. Without using technology or without altering the form in which the linear equation is written, __explain__ how to graph $y = -3x - 6$ on a grid.
Draw the graph on the grid provided.

2. Without using technology or without altering the form in which the linear equation is written, <u>explain</u> how to graph $2x - 5y + 20 = 0$ on a grid.
Draw the graph on the grid provided.

3. Without using technology or without altering the form in which the linear equation is written, <u>explain</u> how to graph

$y + 4 = \dfrac{1}{2}(x - 2)$ on a grid.
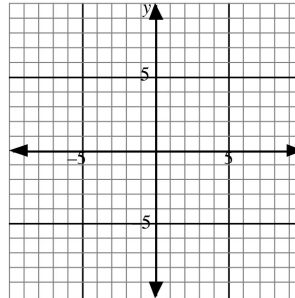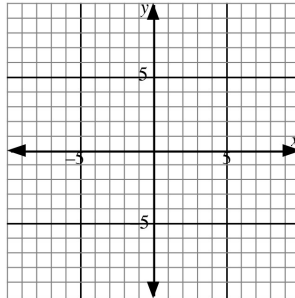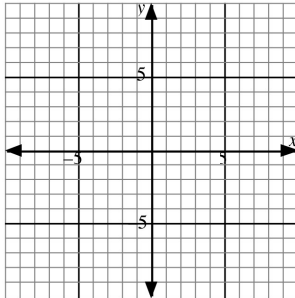
Draw the graph on the grid provided.
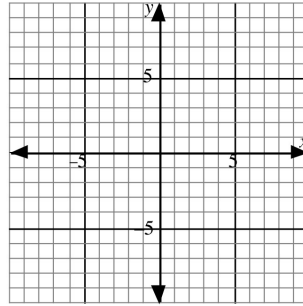
4. Without altering the form in which the linear equation is written, draw the graph (without technology) of each of the following linear relations on the grid provided.

a) $y = -\dfrac{1}{3}x + 3$ **b)** $y - 5 = -2(x + 6)$ **c)** $x - 4y - 8 = 0$

5. Match each linear relation to its graph.
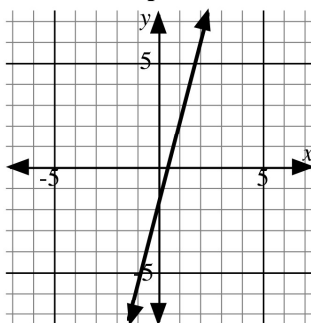
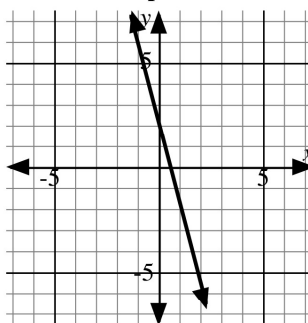**Equation 1:**

$y - 6 = -4(x + 1)$

Equation 2:

$x - 4y - 8 = 0$

Equation 3:

$4x - y - 2 = 0$

Equation 4:

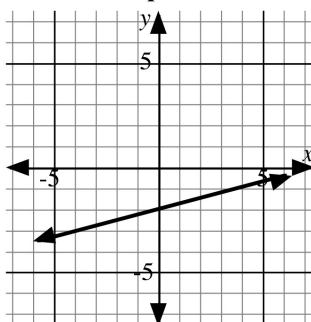$y = -\dfrac{1}{4}x + 2$

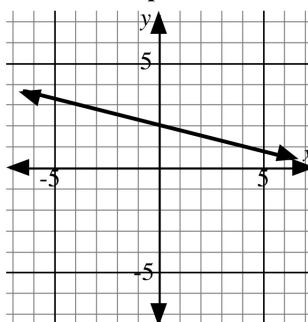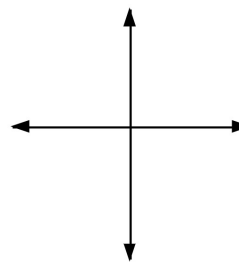**Graph A**

Graph B

Graph C

Graph D

6. a) <u>Explain</u> the strategy used to graph (with technology) the linear relations

$x + 5y + 10 = 0$ and $y - 3 = \dfrac{1}{3}(x + 6)$.

b) State an appropriate window to show *x*- and *y*-intercepts, and draw the graph of both linear relations on the grid.

c) Determine the *x*- and *y*-intercepts of each graph.

7. Consider the following data points expressed in a table of values

a)

x	−1	0	1	2	3
y	−3	−1	1	3	5

b)

x	−6	−3	0	3	6
y	6	5	4	3	2

c)

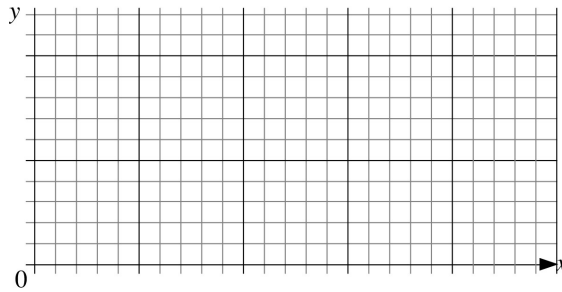| x	0	1	2	3	4
y	1	4	9	16	25

In each case, determine the equation of the linear relationship if it exists.

8. The following data is taken from a continuous linear relationship involving two quantities x and y.

x	32	41	50	59	68	77	86	95
y	0	5	10	15	20	25	30	35

a) Plot the data on the grid and obtain, in general form, the equation of the linear relation which is represented by the data.

b) Rewrite the equation of the linear relation
  i) in terms of x (i.e. $y = ...$)   **ii)** in terms of y (i.e. $x = ...$)

c) The formulas in **b)** are well known in the scientific field. Can you suggest what scientific variables are represented by x and y?

Use the following information to answer the questions #9 and #10.

> The following data is taken from a continous linear
> relationship involving two quantities, x and y.
>
> | x | -10 | −5 | 5 | 10 | 20 |
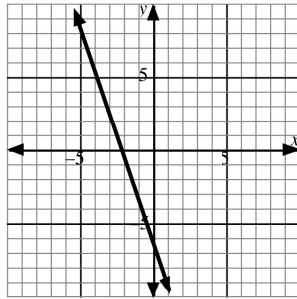> |---|---|---|---|---|---|
> | y | -4 | −3 | −1 | 0 | 2 |

Multiple Choice **9.** When the data is graphed on a grid, the slope of the line is

A.   5

B.   −5

C. $\dfrac{1}{5}$

D. $-\dfrac{1}{5}$

Numerical Response **10.** The equation of the linear relationship can be written in the form $Ax - 5y + C = 0$. The value of $A - C$ is _____ .
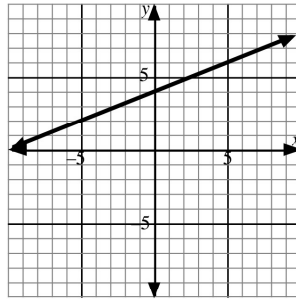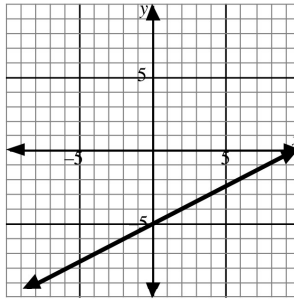
Answer Key

1.

Plot the *y*-intercept $(0, -6)$. Since the slope, -3, equals rise over run, move 3 up and 1 left and plot another point. Repeat for two more points and draw a line through the points.
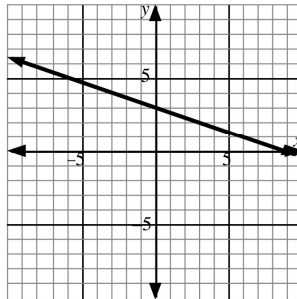
2.

Plot the *x*-intercept $(-10, 0)$ and the *y*-intercept $(0, 4)$. Draw a line through these two points.
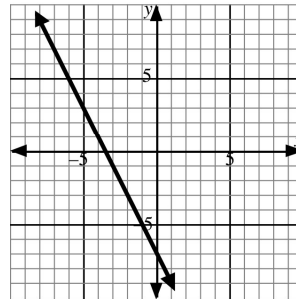
3.

Plot the point $(2, -4)$. Since the slope equals 1/2, move 1 up and 2 right and plot another point. Repeat for two more points and draw a line through the points.
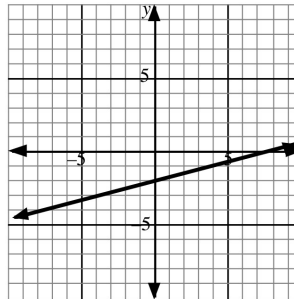
4. a)
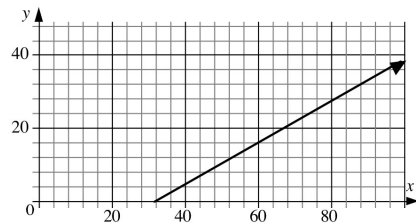

b)

c)

5. 1B, 2C, 3A, 4D.

6. a) Solve each equation for y. Then input Y_1 and Y_2 into the equation editor of the graphing calculator. Press Graph.

b) x:[–20, 10, 5] y:[–6, 10, 2], answers may vary.

c) For $x + 5y + 10 = 0$, x-int = –10, y-int = –2, and for $y - 3 = \frac{1}{3}(x + 6)$, x-int = –15, and y-int = 5.

7. a) $y = 2x - 1$ **b)** $y = -\frac{1}{3}x + 4$ **c)** not linear

8. a) $5x - 9y - 160 = 0$

b) i) $y = \frac{5}{9}x - \frac{160}{9}$, or $y = \frac{5}{9}(x - 32)$

ii) $x = \frac{9}{5}y + 32$

c) x is temperature in °F, and y is temperature in °C.

9. C

10.

1	1		