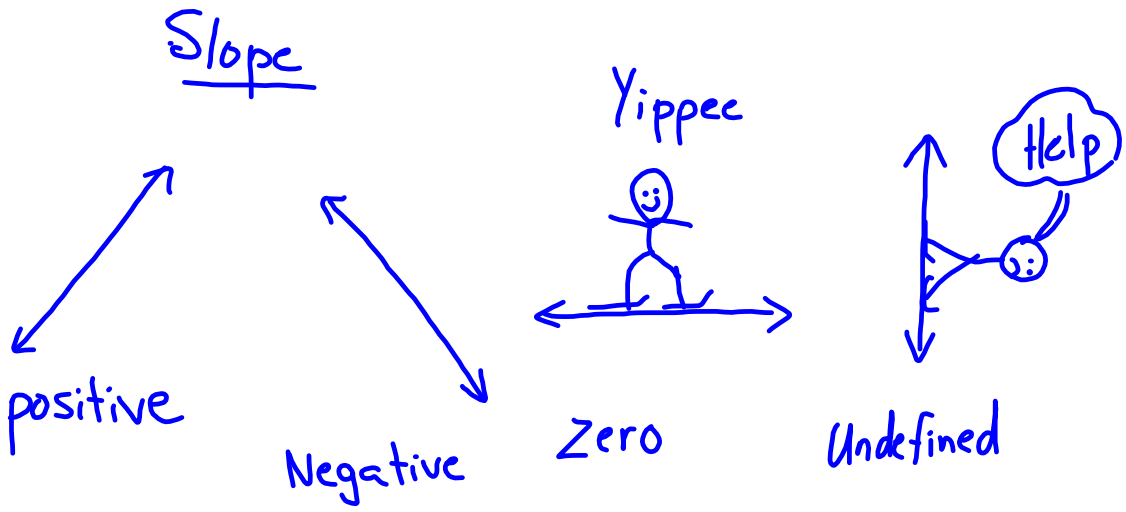


UNIT 4 - LINEAR RELATIONS: WHAT DO YOU ALREADY KNOW?

* vertical / horizontal / oblique
* has the same slope (rise/run)
* table of values
* graphing
* discrete vs continuous
* dependent vs independent
* y-intercept
* equation of a line
* descending / ascending

UNIT 4 - LINEAR RELATIONS: WHAT YOU SHOULD KNOW...

4.1: "Writing Equations to Describe Patterns" (pages 154 - 162)

* How to represent patterns in diagrams, tables of values, and in sentences using equations.
* How to check that equations are correct by substitution.
* How to use equations to answer questions.
* PRACTICE: PAGE 201, #2

2. The pattern in this table continues.

Term Number, n	Term Value, v
1	−5
2	−2
3	1
4	4

+1 +3; +1 +3; +1 +3

As n increases by 1, v increases by 3.

a) Describe the patterns in the table.
b) Use n to write an expression for the term value.
c) Write an equation that relates v and n.
d) Verify the equation by substituting a pair of values from the table.
e) Determine the value of the 21st term.
f) Which term number has a value of 106? How do you know?

$V = 3n - 8$

$V = 3(2) - 8 = 6 - 8 = -2$

$V = 3(3) - 8 = 9 - 8 = 1$

$V = 3n - 8 = 3(21) - 8 = 63 - 8 = 55$

$V = 3n - 8$

$106 = 3n - 8$ (+8 +8)

$\frac{114}{3} = \frac{3n}{3}$

$38 = n$

UNIT 4 - WHAT YOU SHOULD KNOW...

4.2: "Linear Relations" (pages 164 - 173)

* How to represent linear data in tables of values, graphs, equations, and words.
* The difference between continuous and discrete data and what effect they have on graphs.
* How to set up and plot graphs based on tables of values, equations, and words. (x-axis, independent variable, y-axis, dependent variable, origin, etc.)
* **PRACTICE: PAGE 201, #4**

4. Norman has $140 in his savings account. Each month he deposits $20 into this account. Let t represent the time in months and A the account balance in dollars.

a) Create a table to show several values of t and A.

t	A
0	140
1	160
2	180
3	200
4	220

(+1 between each t value; +20 between each A value)

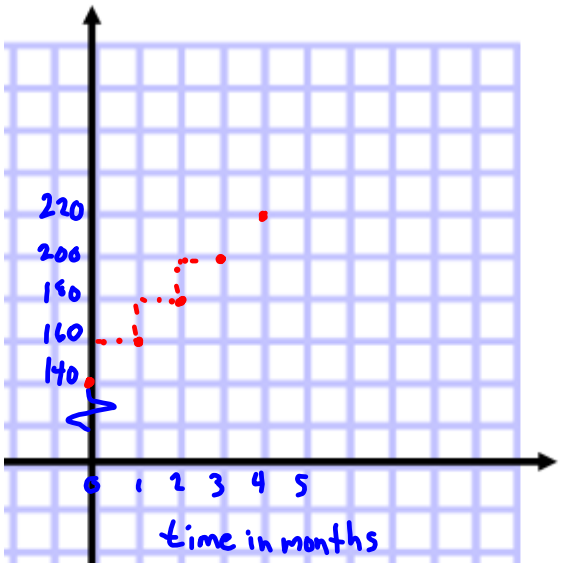
b) Graph the data. Will you join the points? Explain. No. Deposits are $20 intervals

c) Is this relation linear? Justify your answer. Yes m = 20

d) Describe the pattern in the table. How are these patterns shown in the graph? see picture Yes

e) Write an equation that relates A and t.

$A = 20t + 140$



UNIT 4 - WHAT YOU SHOULD KNOW...

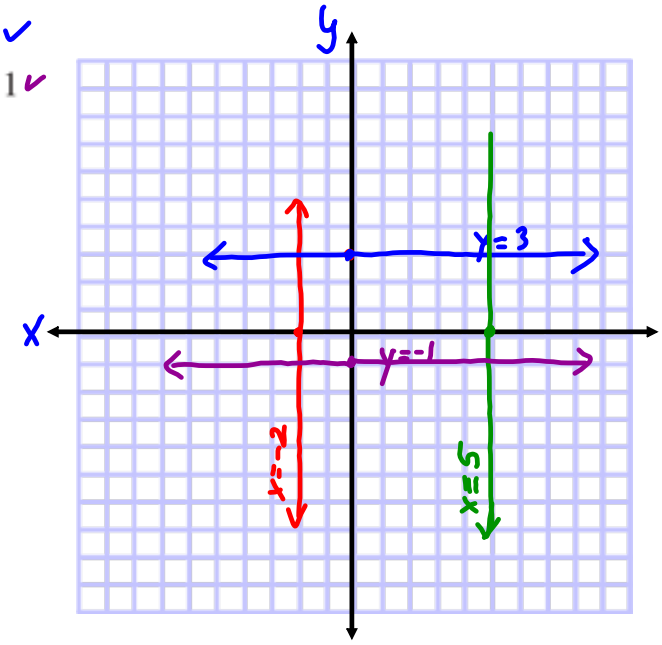
4.3: "Another Form of the Equations for a Linear Relations" (pages 174 - 180)

* The equations of vertical lines (x = a) and horizontal lines (y = a).
* The equations of oblique lines can vary in their appearance. ex.: $y = 2x + 3$
  ex.: $3x - 2y = 6$
* How to identify horizontal, vertical, and oblique lines based on their equations.
* **PRACTICE: PAGE 202, #8 and #10**

8. Graph each equation. Do you need to make a table of values each time? Explain.

a) $x = -2$ ✓ b) $y = 3$ ✓

c) $x = 5$ ✓ d) $y = -1$ ✓



10. Does each equation represent a vertical line, a horizontal line, or an oblique line? How can you tell without graphing?

a) $x = 6$ vertical b) $x - y = 3$ oblique

c) $y + 8 = 0$ horizontal d) $2x + 9 = 0$ Vertical

Have you done the Unit 4 "Mid-Unit Review" on page 181???

If not, please do it for homework tonight (#1 to #7).

4.4 Matching Equations and Graphs

FOCUS • Match equations and graphs of linear relations

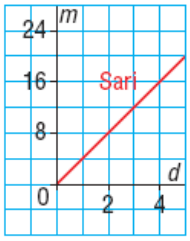
Have you ever participated in a charitable event?

Suppose you are participating in a walk for charity, and you are sponsored $12.00 per kilometre walked. How can you calculate how much money you should get?

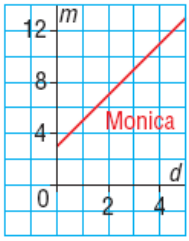
Suppose some sponsors offer you a fixed sum of money for any distance you walk, and other sponsors offer you $7.00 per kilometre. How can you calculate how much money you should get?

Investigate

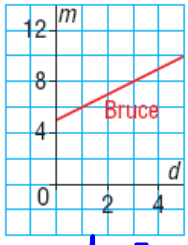
Bruce, Monica, and Sari participate in a 5-km walk for charity.
Each student has a different plan to raise money from her or his sponsors.
These graphs show how the amount of money a sponsor owes is related to the distance walked.



$m = 4d$



$m = 2d + 3$



$m = d + 5$

➤ Match each graph with its equation: $m = 2d + 3$ $m = 4d$ $m = d + 5$
Explain your strategy.

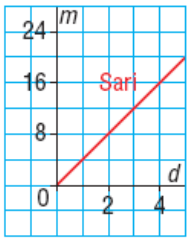
➤ Describe each person's sponsorship plan.

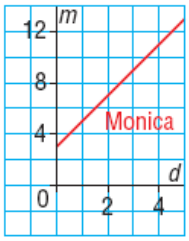
Sari: $0 up front + $4/km
Monica → $3 up front + $2/km
Bruce → $5 up front + $1/km

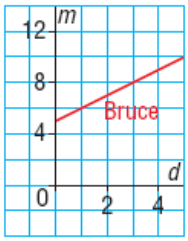
4.4 Matching Equations and Graphs

Investigate

➤ Match each graph with its equation: $m = 2d + 3$ $m = 4d$ $m = d + 5$
Explain your strategy.







➤ Describe each person's sponsorship plan.

4.4 Matching Equations and Graphs

Reflect & Share

Compare your strategies and descriptions with those of another pair of students.
Did you use the same strategies to match each graph and its equation?
If not, explain your strategies to the other students.

Connect

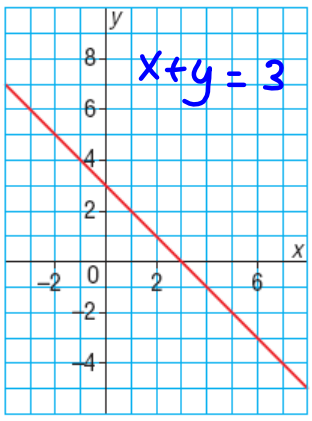
The 3 graphs below have these equations, but the graphs are not in order:

$y = 3x + 3$ $x + y = 3$ $y = 3x - 3$

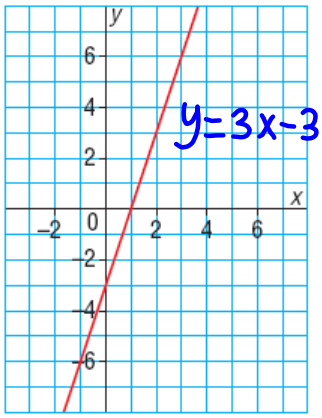
$x + y = 3$

$y = -x + 3$

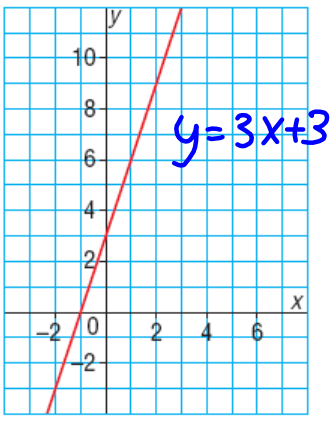
Graph A



Graph B



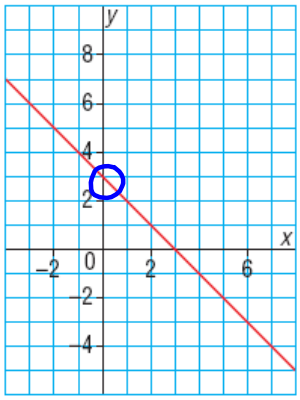
Graph C



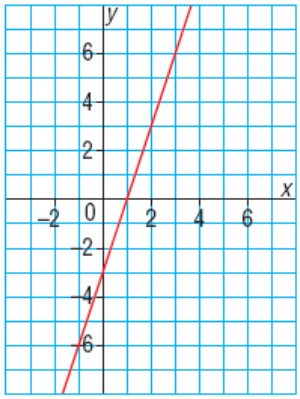
To match each equation with its graph,
use the equation to determine the coordinates of 3 points.
Then find which graph passes through those 3 points.

Connect

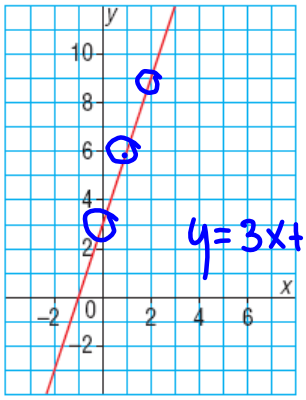
Graph A



Graph B



Graph C



➤ For $y = 3x + 3$

Substitute: $x = 0$ Substitute: $x = 1$ Substitute: $x = 2$

$y = 3(0) + 3$ $y = 3(1) + 3$ $y = 3(2) + 3$

$= 3$ $= 3 + 3$ $= 6 + 3$

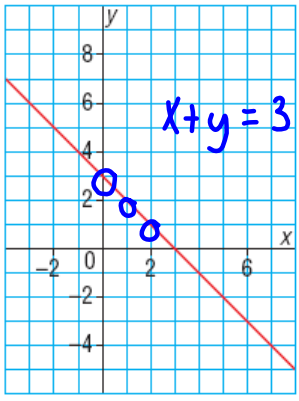
$= 6$ $= 9$

$(0, 3)$ $(1, 6)$ $(2, 9)$

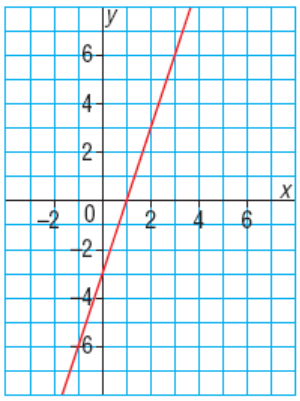
The graph that passes through these 3 points is Graph C.

Connect

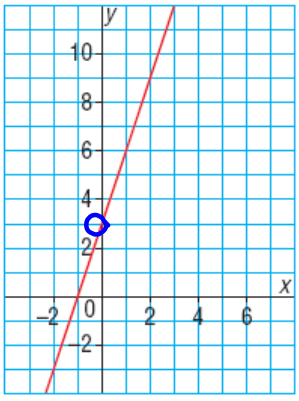
Graph A



Graph B



Graph C



➤ For $x + y = 3$

Substitute: $x = 0$ Substitute: $x = 1$ Substitute: $x = 2$

$0 + y = 3$ $1 + y = 3$ $2 + y = 3$

$y = 3$ $y = 3 - 1$ $y = 3 - 2$

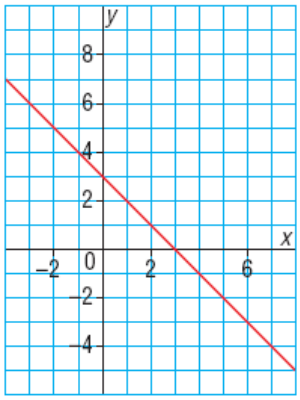
$= 2$ $y = 1$

$(0, 3)$ $(1, 2)$ $(2, 1)$

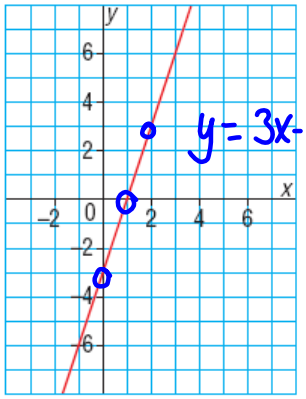
The graph that passes through these 3 points is Graph A

Connect

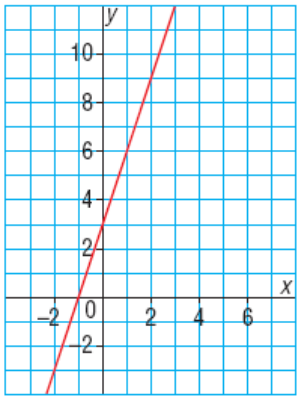
Graph A



Graph B



Graph C



So, the equation $y = 3x - 3$ must match Graph B. Substitute to check.

Substitute: $x = 0$

$y = 3(0) - 3$

$\stackrel{?}{=} -3$

$(0, -3)$

Substitute: $x = 1$

$y = 3(1) - 3$

$\stackrel{?}{=} 3 - 3$

$= 0$

$(1, 0)$

Substitute: $x = 2$

$y = 3(2) - 3$

$\stackrel{?}{=} 6 - 3$

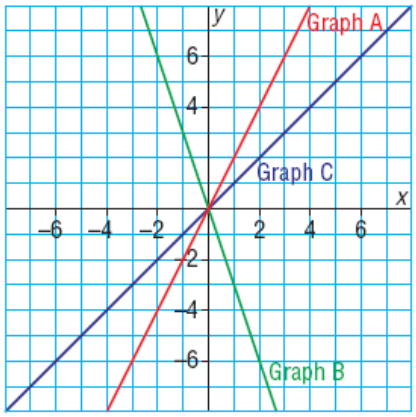
$= 3$

$(2, 3)$

The graph that passes through these 3 points is ? Graph B

Example 1 Matching Equations with Graphs that Pass through the Origin

Match each graph on the grid with its equation below.



$y = x$ —

$y = 2x$ —

$y = -3x$ —

▶ *A Solution*

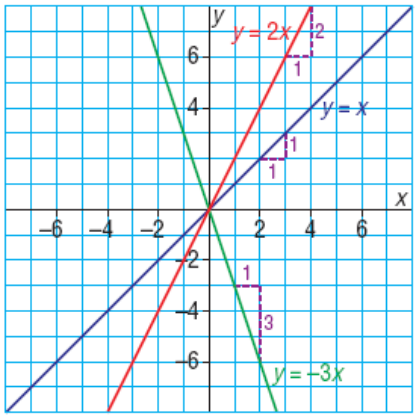
Example 1 Matching Equations with Graphs that Pass through the Origin

Match each graph on the grid with its equation below.

$y = x$
$y = 2x$
$y = -3x$

A Solution

Rewrite $y = x$ as $y = 1x$. The coefficient of x represents the pattern of the points on the graph.
In the equation $y = 1x$, the 1 indicates that when x increases by 1 unit, y also increases 1 unit.
This matches Graph C.
In the equation $y = 2x$, the 2 indicates that when x increases by 1 unit, y increases by 2 units.
This matches Graph A.
In the equation $y = -3x$, the -3 tells us that when x increases by 1 unit, y decreases by 3 units.
This matches Graph B.



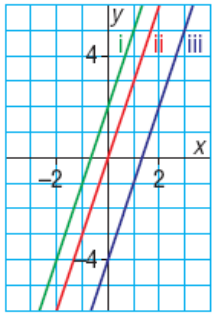
4.4 Matching Equations and Graphs

Example 2 Identifying a Graph Given Its Equation

Which graph on this grid has the equation $y = 3x - 4$?
Justify the answer.

$b = -4$
$m = \frac{3}{1}$

iii



A Solution

4.4 Matching Equations and Graphs

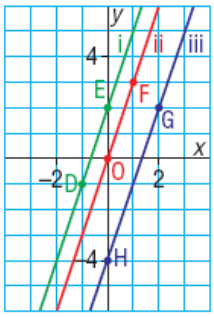
Example 2 Identifying a Graph Given Its Equation

Which graph on this grid has the equation $y = 3x - 4$?
Justify the answer.

A Solution

Pick 2 points on each graph and check to see if their coordinates satisfy the equation.

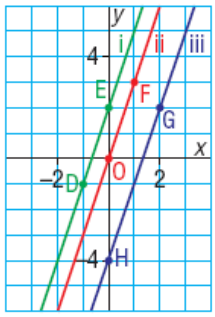
Two points on Graph i have coordinates D(−1, −1) and E(0, 2).
Substitute $x = -1$ and $y = -1$ in $y = 3x - 4$.
Left side: $y = -1$ Right side: $3x - 4 = 3(-1) - 4$
$= -7$
The left side does not equal the right side.
So, these coordinates do not satisfy the equation and Graph i does not have equation $y = 3x - 4$.



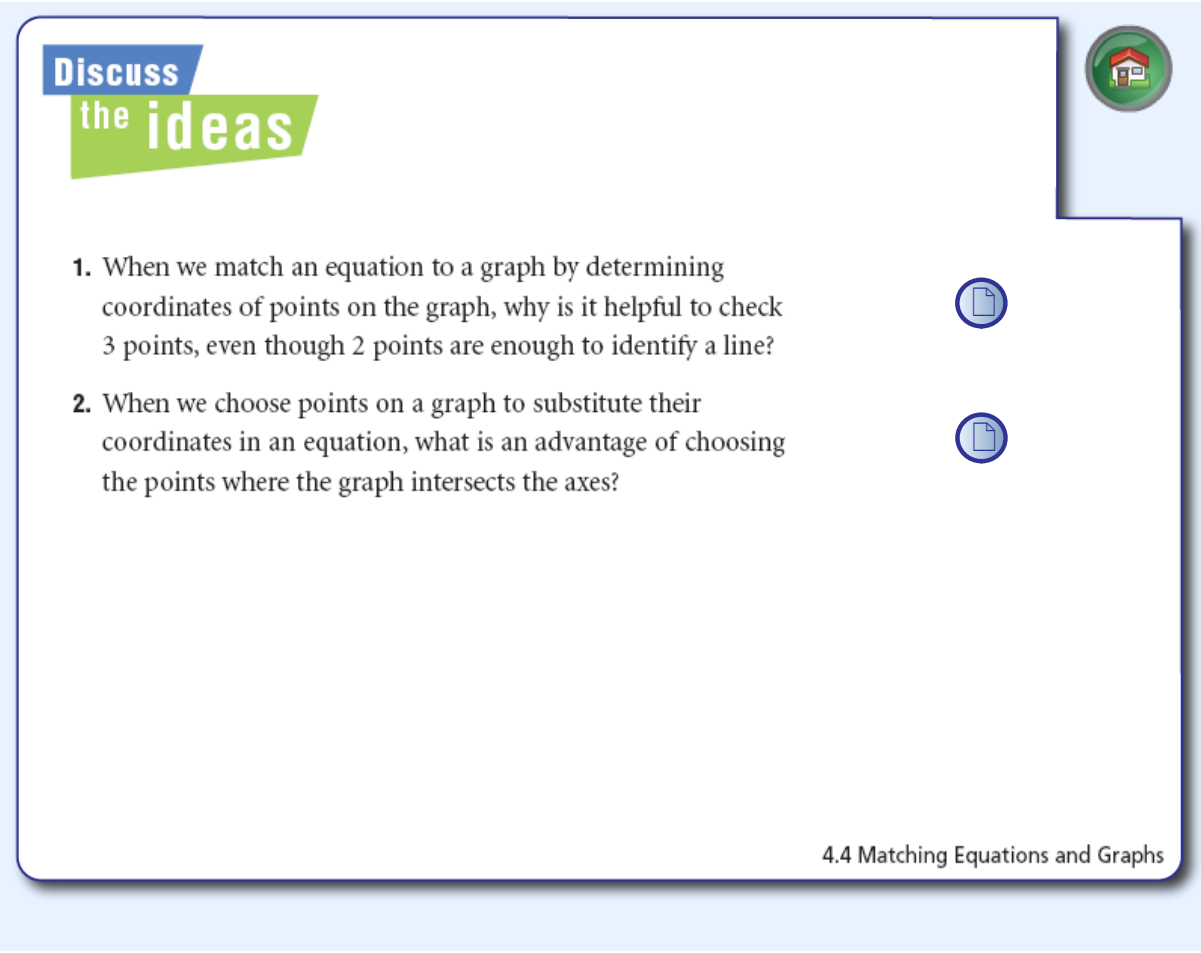
(Solution continues.)

Example 2 Identifying a Graph Given Its Equation

Two points on Graph ii have coordinates O(0, 0) and F(1, 3).
Substitute $x = 0$ and $y = 0$ in $y = 3x - 4$.
Left side: $y = 0$ Right side: $3x - 4 = 3(0) - 4$
$= -4$
The left side does not equal the right side.
So, these coordinates do not satisfy the equation and Graph ii does not have equation $y = 3x - 4$.



Two points on Graph iii have coordinates G(2, 2) and H(0, −4).
Substitute $x = 2$ and $y = 2$ in $y = 3x - 4$.
Left side: $y = 2$ Right side: $3x - 4 = 3(2) - 4$
$= 2$
The left side does equal the right side, so the coordinates of G satisfy the equation.
Substitute $x = 0$ and $y = -4$ in $y = 3x - 4$.
Left side: $y = -4$ Right side: $3x - 4 = 3(0) - 4$
$= -4$
The left side does equal the right side, so the coordinates of H satisfy the equation.
Since both pairs of coordinates satisfy the equation, Graph iii has equation $y = 3x - 4$.



CONCEPT REINFORCEMENT:

MMS9:

page 188: #3 TO #5
page 189: #6 TO #9
page 190: #11 TO #13