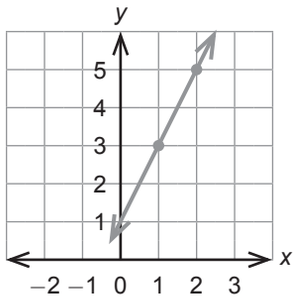
F8-18 Finding the *y*-intercept from Ordered Pairs

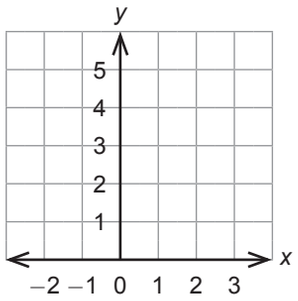
1. a) Graph the list of ordered pairs and join them to make a line. Extend the line to find the *y*-intercept.

i) (1, 3), (2, 5)



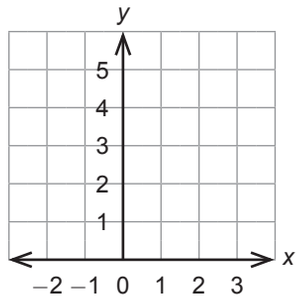
y-intercept: *1*

ii) (−2, 4), (−1, 3)



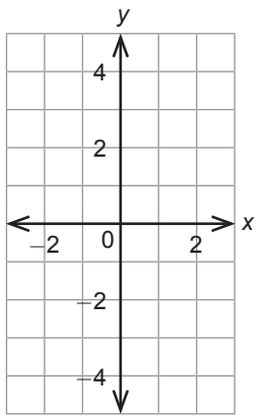
y-intercept: _____

iii) (1, 2), (3, 6)



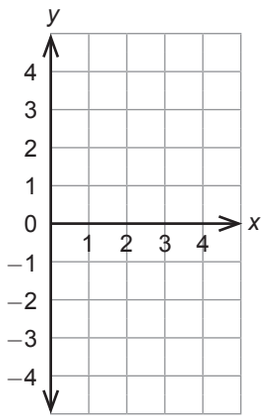
y-intercept: _____

iv) (−2, 2), (1, −4)



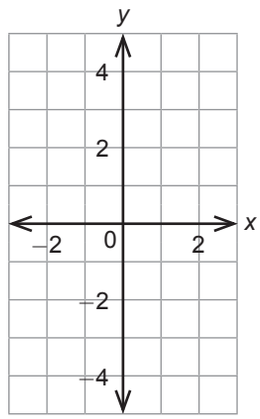
y-intercept: _____

v) (2, 4), (1, 1)



y-intercept: _____

vi) (−1, 3), (1, −3)



y-intercept: _____

b) Find the slope of each line in part a).

i) slope $= \frac{\text{rise}}{\text{run}} = \frac{2}{1} = 2$

ii) slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

iii) slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

iv) slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

v) slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

vi) slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

c) Make a table with the coordinates from part a). Use the slope to complete the table and write an equation. Circle the *y*-intercept. Do parts iv) to vi) in your notebook.

i)

x	**slope** $\times$ ***x***	***y***
1	*2*	*3*
2	*4*	*5*

+ 1

equation: *y = 2x + 1*

ii)

x	**slope** $\times$ ***x***	***y***
−2		*4*
−1		*3*

equation: _____

iii)

x	**slope** $\times$ ***x***	***y***

equation: _____

To find the *y*-intercept from ordered pairs (1, 4), (3, 10) without graphing:

Step 1
Write the coordinates in a table, then find the run, rise, and slope.

	x	slope × *x*	*y*	
+2	1		4	+6
	3		10	

$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{6}{2} = 3$

Step 2
Multiply each *x* by the slope.

x	slope × *x*	*y*
1	3	4
3	9	10

Step 3
What must you add (or subtract) to the second column to get *y*?

x	slope × *x*	*y*
1	3	4
3	9	10

Add 1

The *y*-intercept is +1.

2. A line goes through the given points. Find the *y*-intercept without graphing.

a) (2, −1), (3, −3)

	x	slope × *x*	*y*	
+1	2		−1	*−2*
	3		−3	

$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-2}{1} = -2$

y-intercept: _____

b) (1, −4), (3, 2)

x	slope × *x*	*y*
1		−4
3		2

$\text{slope} = \frac{\text{rise}}{\text{run}} = \text{——} =$

y-intercept: _____

c) (−2, 1), (1, 7)

x	slope × *x*	*y*
−2		1
1		7

$\text{slope} = \frac{\text{rise}}{\text{run}} = \text{——} =$

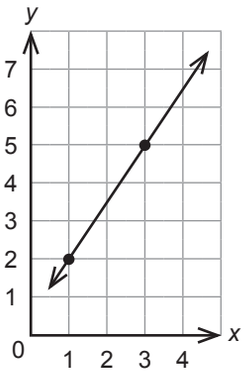
y-intercept: _____

3. a) Four linear functions are represented in different ways below. Find the *y*-intercept for each.

A.

x	*y*
−2	1
−1	0
1	−2
2	−3

B.



C. (−1, −2), (1, 2), (2, 4)

D. $y = -3x - 1$

b) Which function has the greatest *y*-intercept?

c) Which function has a negative *y*-intercept?

d) Which function goes through the origin?

e) Which function represents a proportional relationship between *x* and *y*?

F8-19 Writing an Equation of a Line Using the Slope and *y*-intercept

REMINDER: You can find the slope of a straight line from any two points on the line.

1. a) Find the slope of the line $y = 2x + 5$ using different pairs of points. Make sure you get the same slope each time.

x	*y*
0	
1	

(+1)

run = _____ rise = _____

slope = $\frac{\text{rise}}{\text{run}}$ = ____ =

x	*y*
0	
2	

run = _____ rise = _____

slope = $\frac{\text{rise}}{\text{run}}$ = ____ =

x	*y*
1	
4	

run = _____ rise = _____

slope = $\frac{\text{rise}}{\text{run}}$ = ____ =

b) Which way of finding the slope was easiest? Using $x =$ _____ and $x =$ _____.

2. a) Fill in the table using the equation. Find the slope and *y*-intercept.

i) $y = 3x + 2$

x	*y*
0	*2*
1	*5*

y-intercept: *2*

run = 1 rise = *5 − 2 = 3*

slope = $\frac{\text{rise}}{\text{run}} = \frac{3}{1} = 3$

ii) $y = -1.5x + 2$

x	*y*
0	
1	

y-intercept: _____

run = 1 rise = _____

slope = $\frac{\text{rise}}{\text{run}}$ = ____ =

iii) $y = -x - 0.5$

x	*y*
0	
1	

y-intercept: _____

run = 1 rise = _____

slope = $\frac{\text{rise}}{\text{run}}$ = ____ =

b) Circle the *y*-intercept and underline the slope in each equation. Include the sign.

c) Where can you find the *y*-intercept in the equation? _____

d) Where can you find the slope in the equation? _____

3. Find the slope and the *y*-intercept of the line from the equation.

a) $y = 4x - 5$

slope: *4*

y-intercept: *−5*

b) $y = -1.5x + 2$

slope: _____

y-intercept: _____

c) $y = -x - 0.5$

slope: _____

y-intercept: _____

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

slope: _____

y-intercept: _____

e) $y = -2x + \frac{1}{2}$

slope: _____

y-intercept: _____

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

slope: _____

y-intercept: _____

To write an equation for a line, multiply x by the slope, then add the y-intercept. Write the result equal to y.

If m is the slope of a line and b is the y-intercept, then $y = mx + b$ is called the **slope-intercept form** of the line.

Examples:

Slope	y-intercept	Equation of the Line
2	3	$y = 2x + 3$
1	-2	$y = x - 2$
-5	0	$y = -5x$
1.2	0.5	$y = 1.2x + 0.5$

4. For a line with the given slope and y-intercept, write the equation of the line in slope-intercept form.

a) slope $= 3$, y-intercept $= -3$

$y = 3x - 3$

b) slope $= -3$, y-intercept $= 3$

_____

c) slope $= 1.4$, y-intercept $= -1$

_____

d) slope $= \frac{1}{2}$, y-intercept $= -3$

_____

e) slope $= 2$, y-intercept $= -\frac{2}{3}$

_____

f) slope $= \frac{1}{2}$, y-intercept $= \frac{3}{5}$

_____

5. Find the slope and the y-intercept. Write the equation of the line. Hint: the y-intercept is the y-coordinate of a point that has x-coordinate equal to 0.

a) $A\,(2, -1)$, $B\,(0, -3)$

y-intercept: *-3*

run $=$ *$0 - 2 = -2$*

rise $=$ *$-3 - (-1) = -2$*

slope $= \frac{\text{rise}}{\text{run}} = \frac{-2}{-2} = 1$

equation: *$y = x - 3$*

b) $A\,(0, 2)$, $B\,(1, 3)$

y-intercept:

run $=$ $-$ $=$

rise $=$ $-$ $=$

slope $= \frac{\text{rise}}{\text{run}} =$ ___ $=$

equation: _____

c) $A\,(-2, -1)$, $B\,(0, -5)$

y-intercept:

run $=$ $-$ $=$

rise $=$ $-$ $=$

slope $= \frac{\text{rise}}{\text{run}} =$ ___ $=$

equation: _____

d) $A\,(1, -1)$, $B\,(0, 1.5)$

y-intercept: *1.5*

run $=$ *$0 - 1 = -1$*

rise $=$ *$1.5 - (-1) = 2.5$*

slope $= \frac{\text{rise}}{\text{run}} = \frac{2.5}{-1} = -2.5$

equation: *$y = -2.5x + 1.5$*

e) $A\,(0, -2.5)$, $B\,(1, -3.5)$

y-intercept:

run $=$

rise $=$

slope $= \frac{\text{rise}}{\text{run}} =$ ___ $=$

equation: _____

f) $A\,(-1, -1)$, $B\,(0, -0.5)$

y-intercept:

run $=$

rise $=$

slope $= \frac{\text{rise}}{\text{run}} =$ ___ $=$

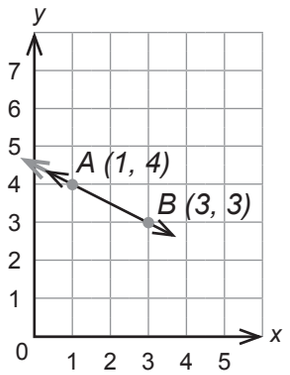
equation: _____

6. Check your answers to Question 5 by substituting.

Example: a) $y = x - 3$, $y = 2 - 3 = -1$, $A\,(2, -1)$ ✓

7. a) Extend the line to find the *y*-intercept. Mark two points with integer coordinates to find the slope of the line. Remember to mark the left point as *A* to have a positive run.

i)



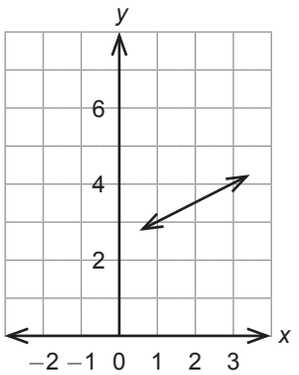
y-intercept: *4.5*

run = *3 − 1 = 2*

rise = *3 − 4 = −1*

slope = $\frac{\text{rise}}{\text{run}} = \frac{-1}{2} = -0.5$

ii)



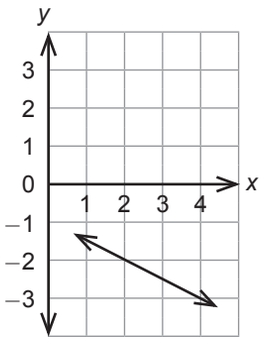
y-intercept: _____

run = _____

rise = _____

slope = $\frac{\text{rise}}{\text{run}} =$ ____ =

iii)



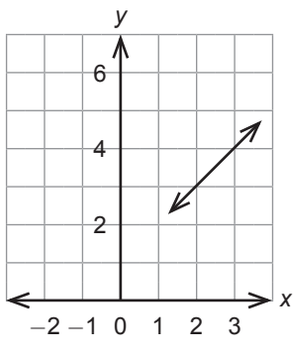
y-intercept: _____

run = _____

rise = _____

slope = $\frac{\text{rise}}{\text{run}} =$ ____ =

iv)



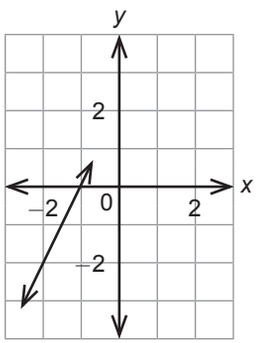
y-intercept: _____

run = _____

rise = _____

slope = $\frac{\text{rise}}{\text{run}} =$ ____ =

v)



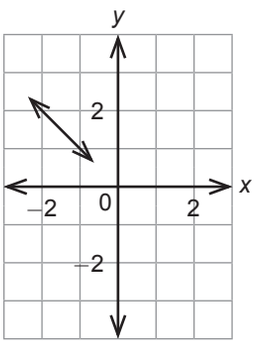
y-intercept: _____

run = _____

rise = _____

slope = $\frac{\text{rise}}{\text{run}} =$ ____ =

vi)



y-intercept: _____

run = _____

rise = _____

slope = $\frac{\text{rise}}{\text{run}} =$ ____ =

b) Write the equation for each line in part a) in slope-intercept form.

i) $y =$ *−0.5x + 4.5*

ii) $y =$ _____

iii) $y =$ _____

iv) $y =$ _____

v) $y =$ _____

vi) $y =$ _____

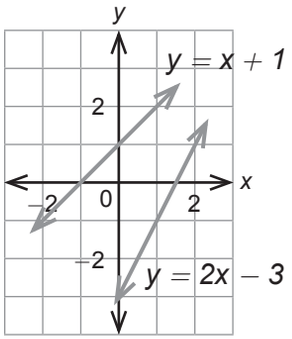
c) Which equation represents a proportional relationship between *x* and *y*? _____

F8-20 Comparing Linear Functions

1. a) Graph both functions on the same grid. Determine which function has the greater slope and which is steeper.

i) $y = x + 1$

$y = 2x - 3$

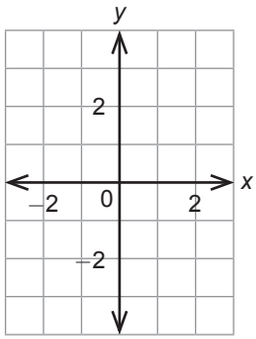


Greater slope: $y = 2x - 3$

Steeper: $y = 2x - 3$

ii) $y = 3x - 1$

$y = x + 2$

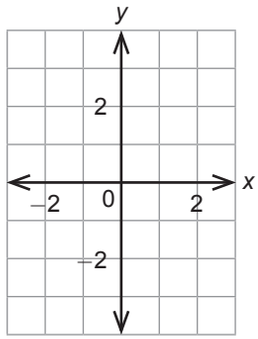


Greater slope: _____

Steeper: _____

iii) $y = 2x - 1$

$y = x - 2$

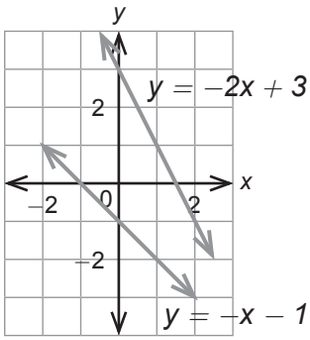


Greater slope: _____

Steeper: _____

iv) $y = -x - 1$

$y = -2x + 3$

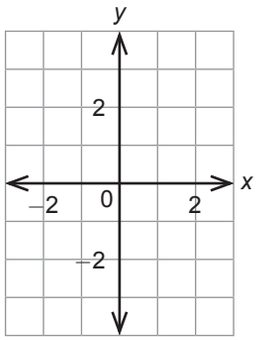


Greater slope: $y = -x - 1$

Steeper: $y = -2x + 3$

v) $y = -3x + 1$

$y = -2x - 2$

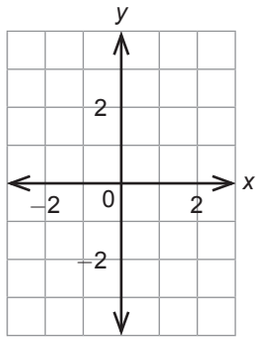


Greater slope: _____

Steeper: _____

Bonus ▶ $y = x + 1$

$y = -3x + 1$



Greater slope: _____

Steeper: _____

b) Does a greater slope always mean a steeper slope? _____

c) Find the absolute value of the slopes for each part in a).

i) $|1| = 1, |2| = 2$

ii)

iii)

iv) $|-1| = 1, |-2| = 2$

v)

Bonus ▶

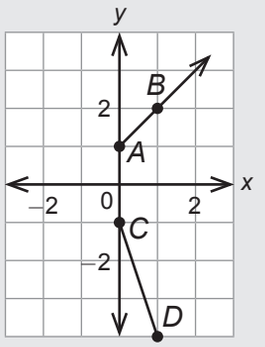
d) Does a greater absolute value slope always mean a steeper slope? _____

A greater slope does not always mean a steeper slope. You need to compare the absolute values of slopes to find out which is steeper.

Example: Line AB has a slope of 1 and CD has a slope of -3 so AB has a greater slope than CD. However, line CD has a steeper slope than AB.

Slope of AB: 1 Absolute value of slope of AB: 1

Slope of CD: -3 Absolute value of slope of CD: 3

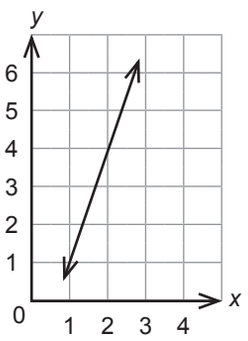


2. a) Four linear functions are represented in different ways below. Find the slope of each.

A.

x	y
-1	-4
1	2
2	5
3	8

B.



C. $(-2, 0), (0, 2), (3, 5)$ **D.** $y = -4x + 3$

b) Which two functions have the same slope? _____ and _____

c) Which function has the greatest slope? _____

d) Which function has the steepest slope? _____

3. The table shows the temperatures in the first week of May in Los Angeles, CA, at 8 a.m. and 4 p.m.

	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**
Temperature at 8 a.m. (°F)	79	71	75	76	83	83	78
Temperature at 4 p.m. (°F)	74	71	78	84	85	77	75

a) Find the changes in temperature for each day.

	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**
Change in Temperature	-5						

b) Which day had the greatest change in temperature? _____

c) Find the change in temperature per hour for each day.

d) Which day had the greatest change in temperature per hour? _____

e) Explain how you can use change in temperature to calculate change in temperature per hour.

_____

F8-21 Using the Equation of a Line to Solve Word Problems

1. A train is traveling at a constant speed of 50 mi/h.

a) Write an equation for the distance the train traveled after x hours. $y =$ _____

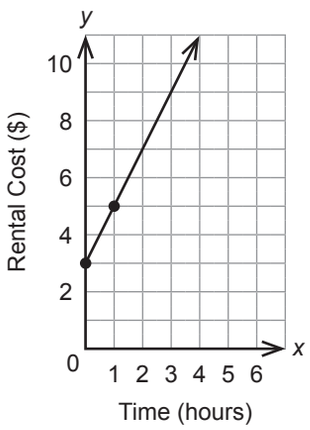
b) How far does the train travel in 3 hours? Hint: Replace x with 3. _____

c) How far does the train travel in 4.5 hours? _____

d) How long does it take for the train to travel 250 miles?
Hint: Substitute $y = 250$ in the equation, then solve for x.

e) How long does it take for the train to travel 425 miles?

2. To rent a pair of skates, you pay a $3 flat fee plus $2 per hour, as shown in the graph below.



a) How much does it cost to rent a pair of skates for 1 hour? _____

b) How much does it cost to rent a pair of skates for 3 hours? _____

c) Julie paid $10 to rent a pair of skates. How many hours did she pay for?

_____

d) Find the y-intercept and the slope of the line.

y-intercept: _____ slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

e) Write the equation of the line. $y =$ _____

f) Substitute $x = 1$ in the equation to find the cost of renting skates for 1 hour. _____

g) Where do you see the flat rate in the equation? _____

h) How you can find the answer to part b) using the equation? _____

i) Find the answer to part c) by replacing y with 10 in the equation and solving for x.

j) Can you use the graph as is to find the cost of renting a pair of skates for 10 hours?
Why or why not? _____

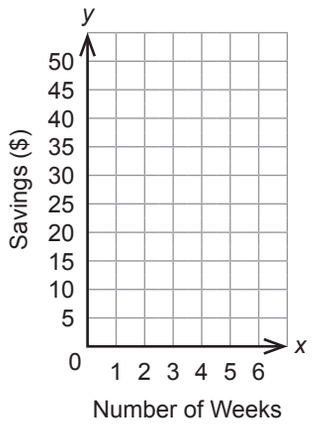
k) How could you use the equation to find the cost of renting a pair of skates for 10 hours?

_____

3. Kim has $10 and she saves $5 every week.

a) Create a table of values for Kim's savings after x weeks.

x weeks	$\$y$ in savings
0	*10*
1	*15*
2	
3	



b) Plot the ordered pairs from the table of values above on the graph on the right.

c) Find the y-intercept and the slope of the line.

y-intercept: _____ slope $= \frac{\text{rise}}{\text{run}} = \frac{\quad}{\quad} =$

d) Write the equation of the line. $y =$ _____

e) Kim plans to buy a skateboard for $85. How many weeks must she save to buy the skateboard?

f) Did you need the graph to answer parts c), d), and e)? _____

4. Tony has a $25.00 gift card for an online role-playing game. Subscribing to the game costs $4.25 per month.

a) How much money remains on the gift card after the first month? _____

b) Fill in the table of values for his remaining money after x months.

x months	$\$y$ on gift card
0	*25.00*
1	*20.75*
2	
3	

c) For the table above, find the y-intercept and the slope of a line that goes through all points.

d) Write the equation of the line. $y =$ _____

e) How much money remains on the gift card after 5 months? _____

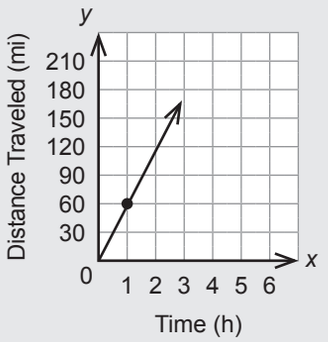
F8-22 Describing Graphs

Speed is the rate of distance traveled in a certain time.
Example: A car with a speed of 60 mi/h travels 60 miles every hour.

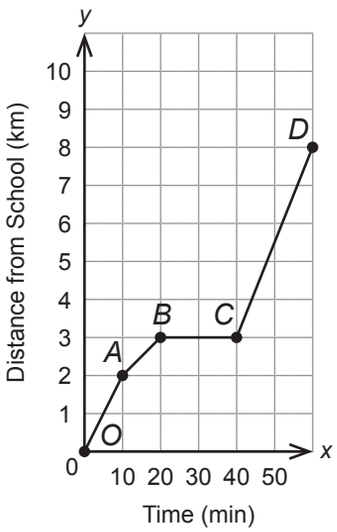
To find the speed, you can find the slope of the line in a graph of distance and time, where time is the horizontal axis.

Example: run $= 1 - 0 = 1$ hour, and rise $= 60 - 0 = 60$ miles

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{60}{1} = 60, \text{ so the speed is 60 mi/h}$$



1. A group of Grade 8 students take a bike trip from their school. The graph shows the times and distances of their trip.



a) How far did the students bike in 1 hour? _____

b) Complete the table to find the slope between …

		Run (min)	Rise (km)	Slope (km/min)
i)	*O* and *A*	$10 - 0 = 10$	$2 - 0 = 2$	$\frac{\text{rise}}{\text{run}} = \frac{2}{10} = 0.2$
ii)	*A* and *B*			$\frac{\text{rise}}{\text{run}} = \_\_\_\_ =$
iii)	*B* and *C*			$\frac{\text{rise}}{\text{run}} = \_\_\_\_ =$
iv)	*C* and *D*			$\frac{\text{rise}}{\text{run}} = \_\_\_\_ =$

c) Which line segment has the steepest slope? _____

d) What was the maximum speed of the group during the trip? _____

e) The maximum speed of the group happened in between _____ minutes and _____ minutes.

f) The students stopped to have a rest. Which line segment shows the rest? _____
Hint: During the rest, the distance from the school doesn't change.

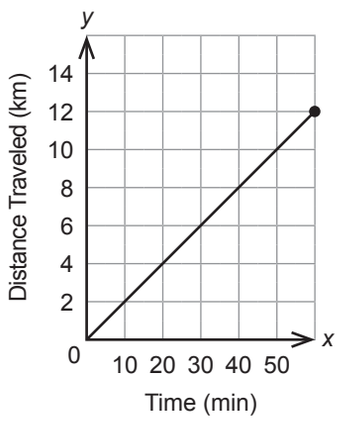
g) What is the students' speed during the rest? _____

2. Three students run 12 km in 60 minutes.

- Beth starts slowly and increases her speed as she warms up.
- John runs at a constant speed.
- Anna starts running fast, then she slows down.

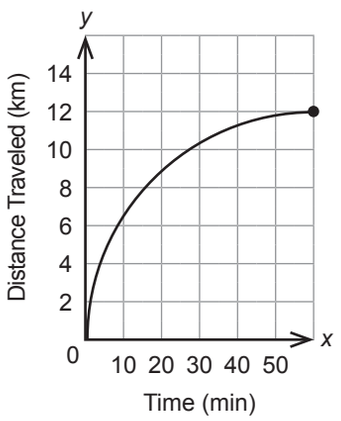
a) Match the graph to the student by writing a name under each graph.

A.



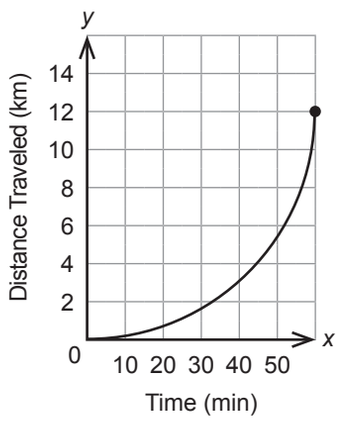
_____

B.



_____

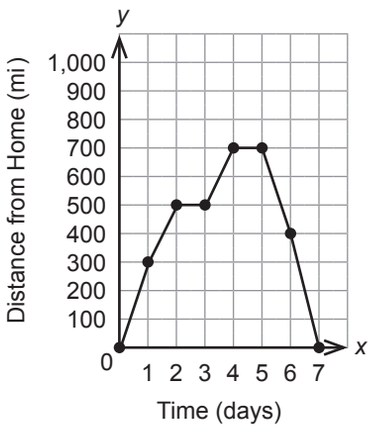
C.



_____

b) Which graph represents a linear function? _____

3. May took a road trip to her aunt's house (500 miles away) and her grandmother's house (700 miles away). The graph shows how far from home she was during the last week.



a) How many miles did May drive in the first day? _____

b) How many days did she take to drive to her aunt's house?

_____

c) Which days did May not drive? _____

d) How many nights did May stay at her grandmother's house?

_____

e) The nights that May didn't sleep at her relatives' homes, she stayed in motels. How many nights did May stay in a motel? _____

f) Write a story about May's trip to describe all line segments of the graph.

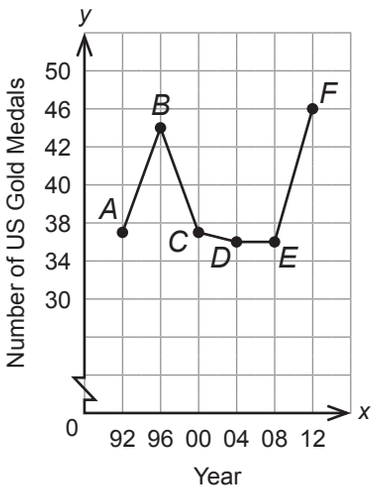
_____

_____

_____

_____

4. The graph shows the number of gold medals won by the United States at each of the Summer Olympic Games from 1992 to 2012.



a) Find the slope of each line segment.

b) Which line segment has the greatest slope? _____

c) In what year did the US have the best results compared with the previous Summer Olympic year's results? _____

d) Which line segment has the smallest slope? _____

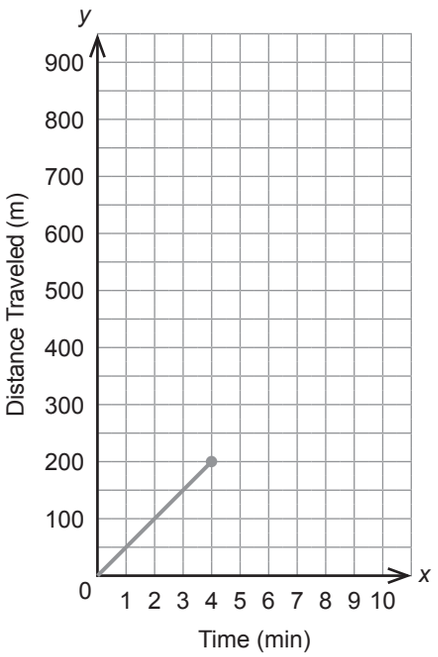
e) In what year did the US have the worst results compared with the previous Summer Olympic year's results? _____

f) Which line segment has the slope equal to 0? _____

g) In what year did the results not change from the previous Summer Olympic year? _____

5. Sam lives 900 m from his school. Today, Sam:

- walked 200 m in 4 minutes,
- then ran 600 m in 3 minutes,
- then rested for 1 minute, and
- then walked the last 100 m in 2 minutes.



a) How far did Sam go in the first 7 minutes? _____

b) How far did Sam go in the first 8 minutes? _____

c) Fill the table to find how far Sam went after *t* minutes. Then use the table to complete the graph at right.

Time (min)	4	7	8	10
Distance Traveled (m)	*200*			

d) How long does it take Sam to get to school? _____

e) Find the slope of each line segment to find Sam's speed during each part of his trip:

i) ii) iii) iv)

f) In what period of time does the graph have the steepest slope? _____