

# Unit 2 – Linear Relations

## Chapter 6 – Linear Relations Workbook

MPM1D

The diagram shows the linear equation  $y = mx + b$  with several annotations. The variable  $y$  is in green and labeled "Range". The variable  $x$  is in purple and labeled "Domain". The coefficient  $m$  is in black and labeled "Slope" with a blue arrow pointing to it. The constant  $b$  is in black and labeled "y-intercept" with a red arrow pointing to it. The terms  $mx$  and  $+ b$  are enclosed in blue and red boxes, respectively.

$y = mx + b$

*Slope* =  $\frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}$

## Chapter 6 Worksheet Checklist

Worksheet	Check ✓
6.1 Equation of a Line in Slope y-intercept Form Worksheet 1	
6.1 Day 2 Worksheet: The Equation of a Line in Slope y-Intercept Form: $y = mx + b$	
6.2 – Standard Form Worksheet	
6.3 – Graphing Using Intercepts Worksheet	
6.4 – Parallel and Perpendicular Lines Worksheet	
6.5 – Slope and Point	
6.6 – Find the Equation of a Line Given Two Points Worksheet	
6.7 Practice: Linear Systems	
Chapter 6 Review	
Math 9 Practice Test	

Mark /10	0-2	3-5	6-8	9-10
<b>Work completion for chapter 6</b>	Little to know homework done throughout chapter.	Some homework completed. Unorganized.	Most homework completed. Work clear and organized.	All homework completed accurately. Great organization of work.

Mark /4	1	2	3	4
<b>In Class Work for Chapter 6</b>	Class time not used well for work completion. Inattentive during lessons. Need to improve at limiting distractions.	Some work completed during class. Sometimes distracted during lessons.	Works well during class. Minimal distractions. Good attention during lessons.	Always uses class time efficiently. Pays attention and contributes to lessons.

**Comments:**

## 6.1 Equation of a Line in Slope y-intercept Form

MPM1D

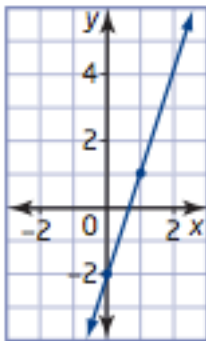
Jensen

1. Identify the slope and the y-intercept of each line:

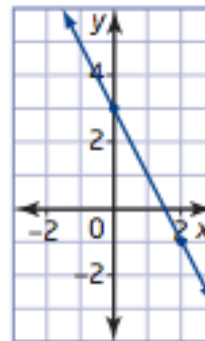
Equation	Slope	y-intercept
a) $y = 4x + 1$		
b) $y = \frac{2}{3}x + 3$		
c) $y = x - 2$		
d) $y = -\frac{2}{3}x$		
e) $y = 3$		
f) $y = -x - \frac{1}{2}$		

2. Find the slope and y-intercept of each line:

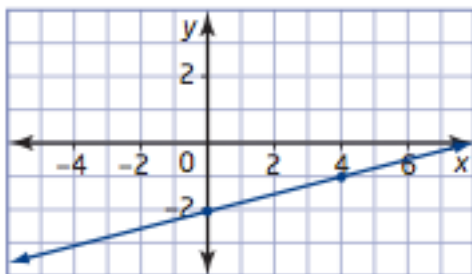
a)



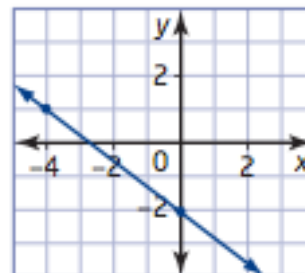
b)



c)



d)



3. Write the equation of each line in question #2

a)

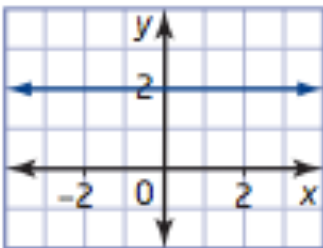
b)

c)

d)

4. Write the equation of each line. State its slope and y-intercept if they exist:

a)

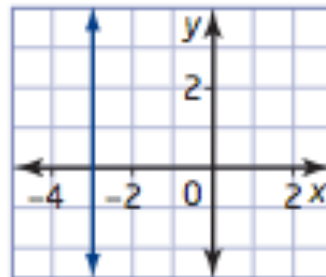


**Equation:**

**Slope:**

**y-intercept:**

b)

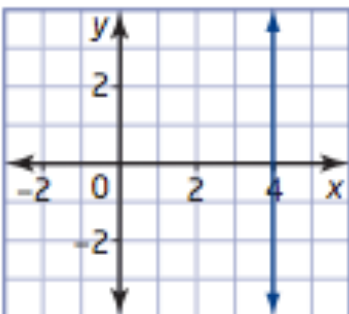


**Equation:**

**Slope:**

**y-intercept:**

c)

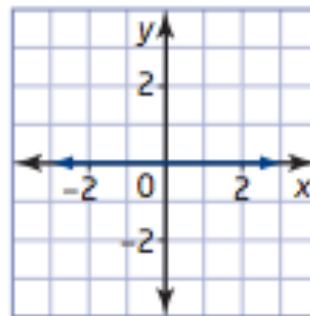


**Equation:**

**Slope:**

**y-intercept:**

d)



**Equation:**

**Slope:**

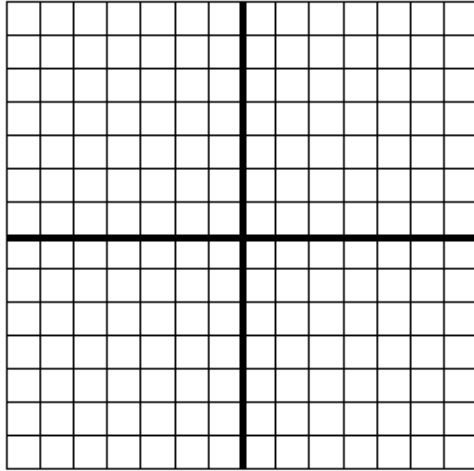
**y-intercept:**

5. The line in question 4 part d) has a special name. What is it?

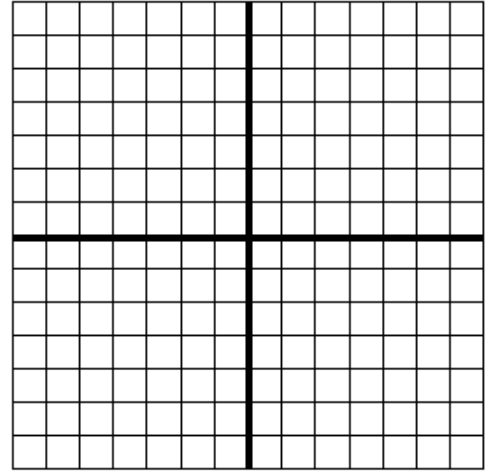
6. The slope and y-intercept are given. Write the equation and graph each line:

	Slope	y-intercept
a)	$\frac{2}{3}$	3
b)	$-\frac{3}{5}$	1
c)	-2	0
d)	$\frac{4}{3}$	-4
e)	0	-4

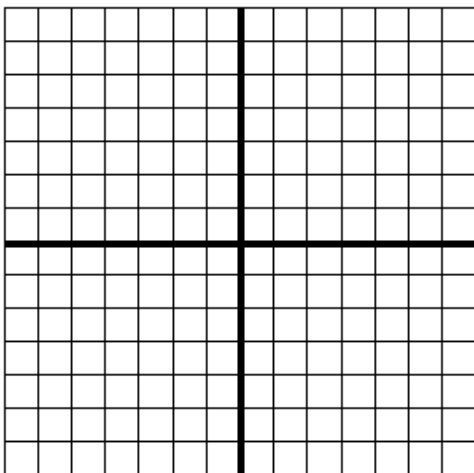
a) Equation:



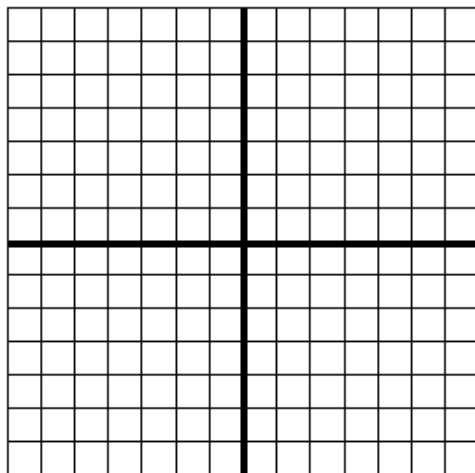
b) Equation:



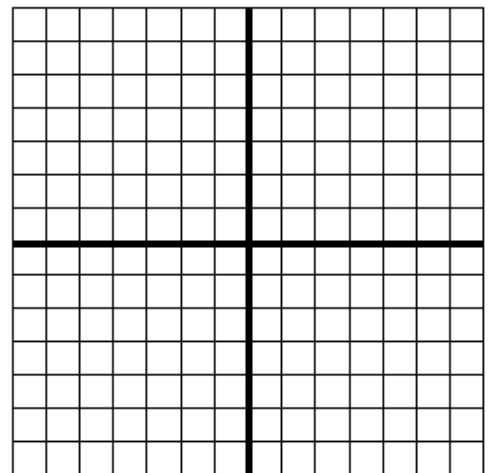
c) Equation:



d) Equation:



e) Equation:

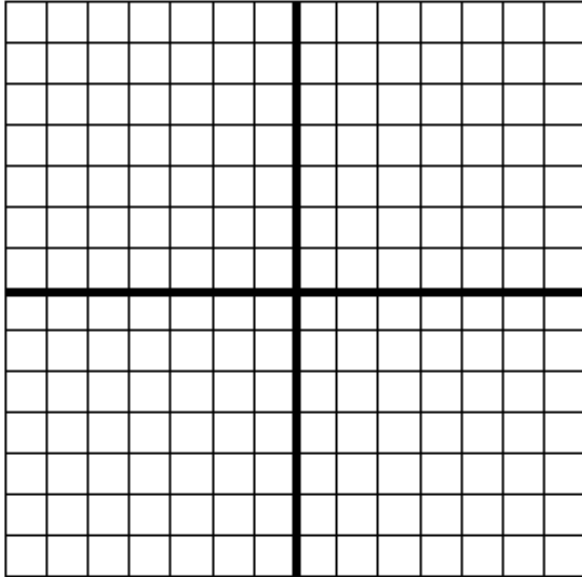


7. State the slope and y-intercept of each line, if they exist. Graph each line.

a)  $y = -5$

slope:

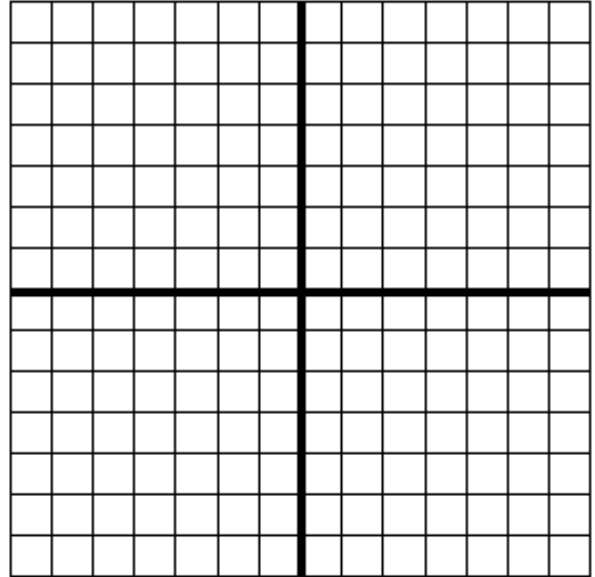
y-intercept:



b)  $x = 1$

slope:

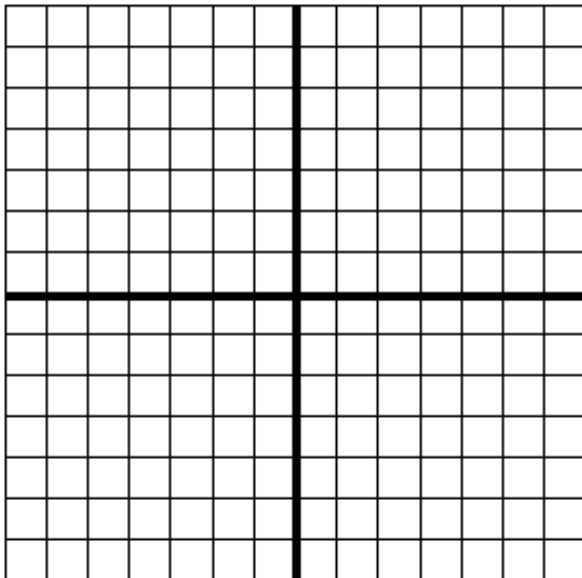
y-intercept:



c)  $y = \frac{7}{2}$

slope:

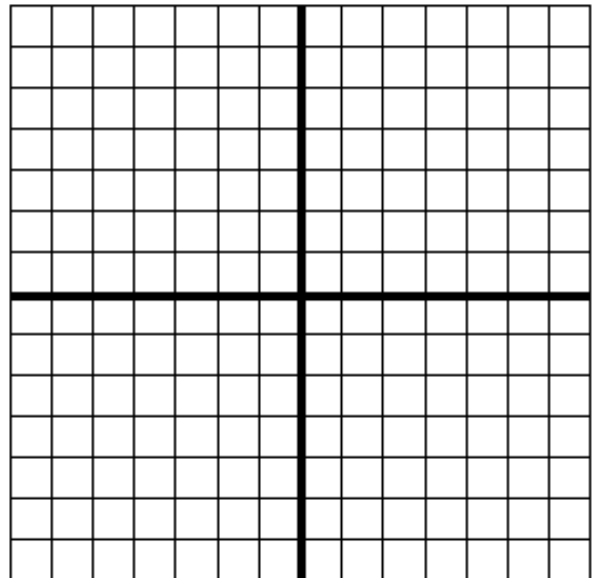
y-intercept:



b)  $x = -2.5$

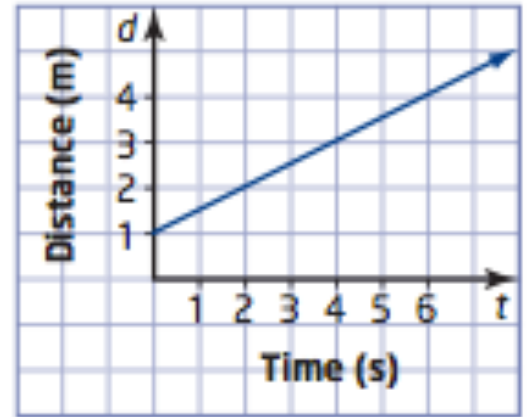
slope:

y-intercept:



8. The distance-time graph of a person walking in front to a motion sensor is shown.

a) How far from the sensor did the person begin walking?



b) How fast did the person walk? (find the slope)

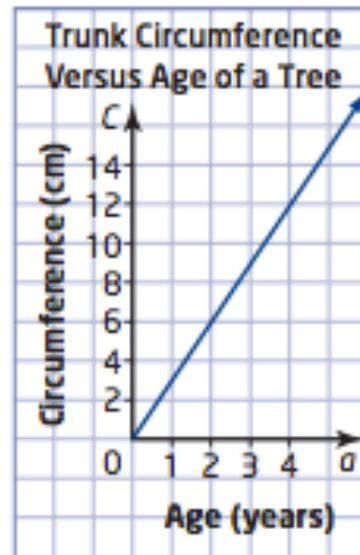
c) Did the person walk away from or toward the sensor? Explain.

10. Identify the slope and the vertical intercept of each linear relation and explain what they represent. Write an equation to describe the relationship.

a)



b)



Slope:

y-intercept:

Equation:

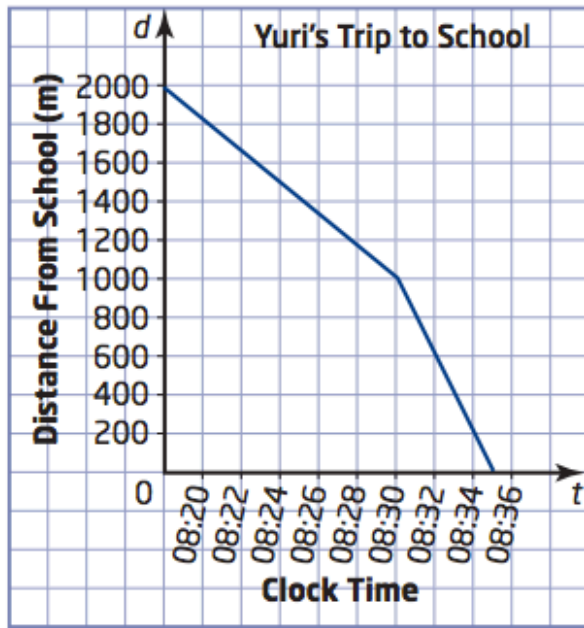
Slope:

y-intercept:

Equation:

12.

Yuri tries hard not to be late for class, but sometimes he does not quite make it on time. Class begins at 8:30 A.M. The distance-time graph shows his progress from home to school one morning.



Write a story about Yuri's trip to school. Include the speed, distance, and time in your story.

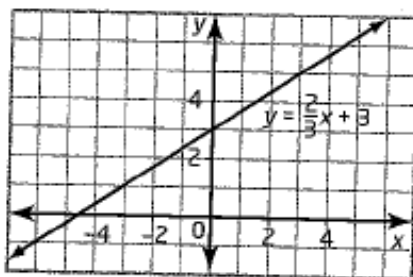


6.1 The Equation of a Line in Slope y-Intercept Form:  
 $y = mx + b$ , pages 296-307

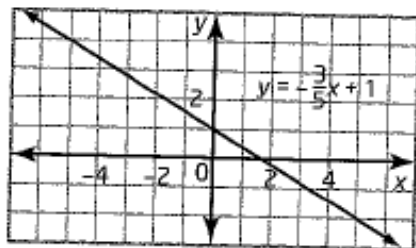
	Equation	Slope	y-intercept
a)	$y = 4x + 1$	4	1
b)	$y = \frac{2}{3}x + 3$	$\frac{2}{3}$	3
c)	$y = x - 2$	1	-2
d)	$y = -\frac{2}{3}x$	$-\frac{2}{3}$	0
e)	$y = 3$	0	3
f)	$y = -x - \frac{1}{2}$	-1	$-\frac{1}{2}$

2. a) slope 3; y-intercept -2  
 b) slope -2; y-intercept 3  
 c) slope  $\frac{1}{4}$ ; y-intercept -2  
 d) slope  $-\frac{3}{4}$ ; y-intercept -2
3. a)  $y = 3x - 2$  b)  $y = -2x + 3$   
 c)  $y = \frac{1}{4}x - 2$  d)  $y = -\frac{3}{4}x - 2$
4. a)  $y = 2$ ; slope 0; y-intercept 2  
 b)  $x = -3$ ; slope undefined; no y-intercept  
 c)  $x = 4$ ; slope undefined; no y-intercept  
 d)  $y = 0$ ; slope 0; y-intercept 0
5. x-axis

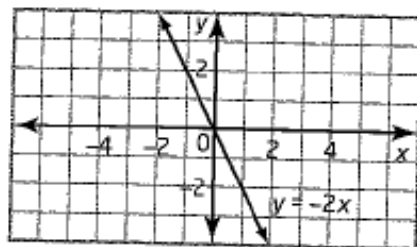
6. a)  $y = \frac{2}{3}x + 3$



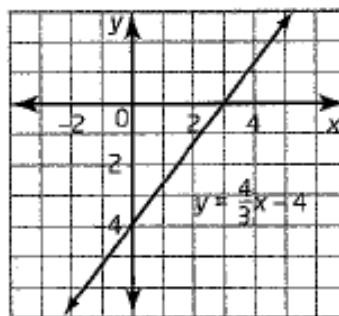
b)  $y = -\frac{3}{5}x + 1$



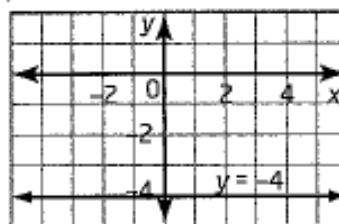
c)  $y = -2x$



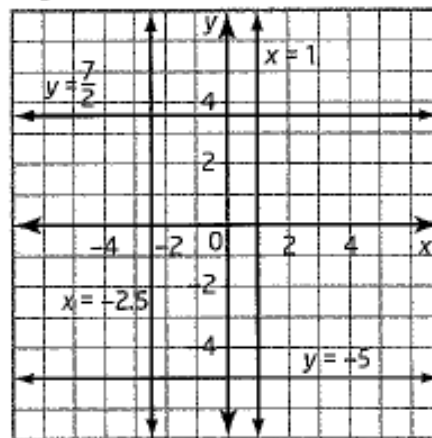
d)  $y = \frac{4}{3}x - 4$



e)  $y = -4$



7. a) slope 0; y-intercept -5  
 b) slope undefined; no y-intercept  
 c) slope 0; y-intercept  $\frac{7}{2}$   
 d) slope undefined; no y-intercept



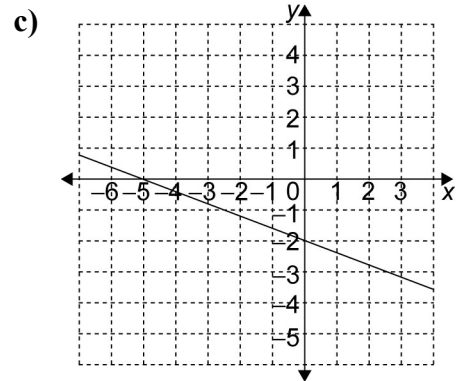
8. a) The person was at an initial distance of 1 m from the sensor.  
 b) The person was walking at a speed of 0.5 m/s.  
 c) The person was walking away from the sensor. This is because on the graph, the person's distance from the sensor increases as time goes by.
10. a) slope 1; t-intercept 1.5; The slope represents Shannon's walking speed of 1 m/s away from the sensor. The t-intercept represents Shannon's initial distance of 1.5 m away from the sensor;  $d = t + 1.5$ .  
 b) slope 3; a-intercept 0; The slope shows that the circumference of the trunk is three times its age. The a-intercept shows that when the tree began to grow from a seed, it had circumference zero.  $C = 3a$ .

12. Answers may vary

# 6.1 Day 2 Worksheet: The Equation of a Line in Slope $y$ -Intercept Form: $y = mx + b$

1. Complete the table.

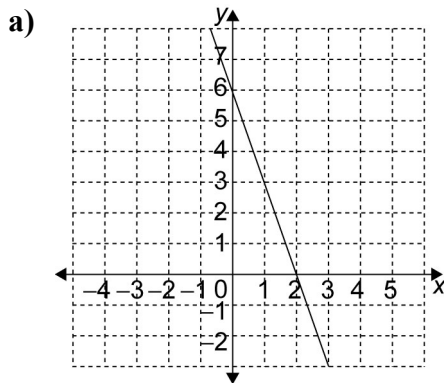
	Equation	Slope	$y$ -Intercept
a)	$y = 4x + 1$		
b)	$y = \frac{x}{2} - 3$		
c)	$y = -2x$		
d)	$y = -x + 2$		



slope:

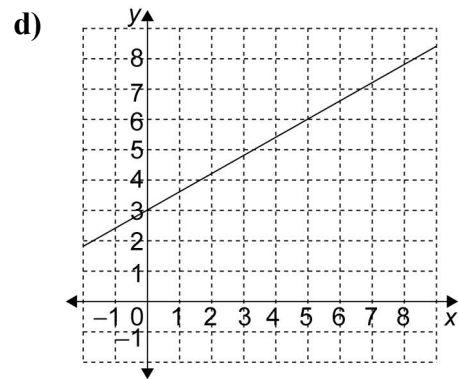
$y$ -intercept:

2. Find the slope and  $y$ -intercept of each line.



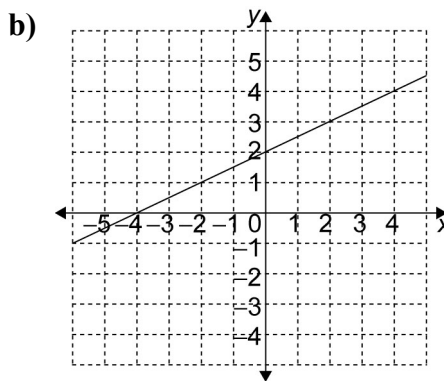
slope:

$y$ -intercept:



slope:

$y$ -intercept:



slope:

$y$ -intercept:

3. Write the equation of each line in question 2.

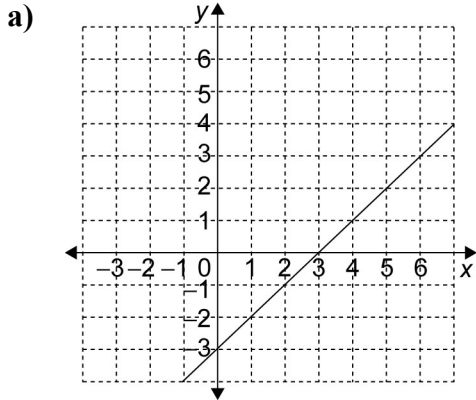
a)

b)

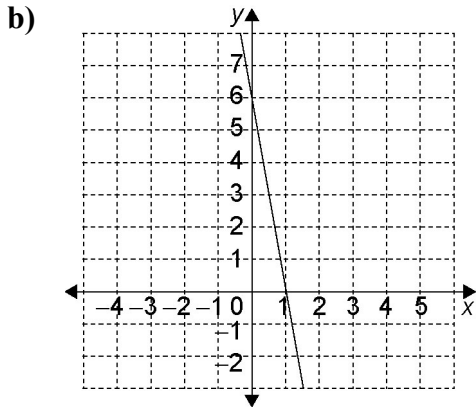
c)

d)

4. Write the equation of each line.



**Equation:**



**Equation:**

5. Write the equation of a line with each slope and y-intercept.

	Slope	y-Intercept
a)	-2	1
b)	$\frac{2}{3}$	-4
c)	5	0
d)	$-\frac{3}{2}$	3

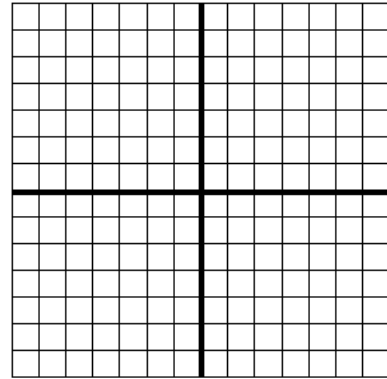
- a)
- b)
- c)
- d)

6. Find the slope and y-intercept of each line, if they exist. Graph each line.

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

slope:

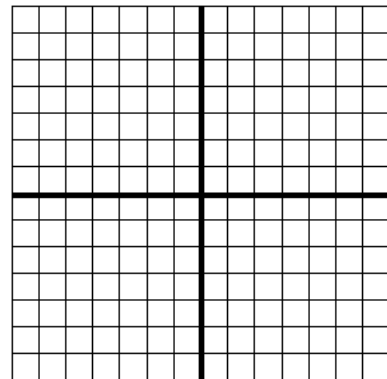
y-intercept:



b)  $y = x - 4$

slope:

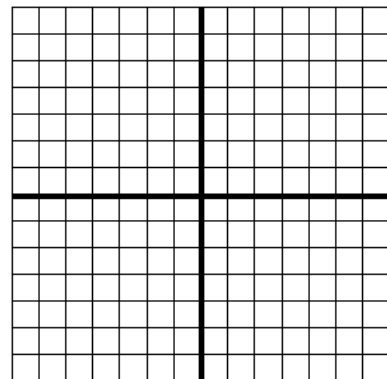
y-intercept:



c)  $y = 5$

slope:

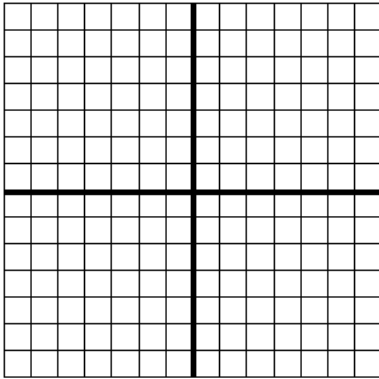
y-intercept:



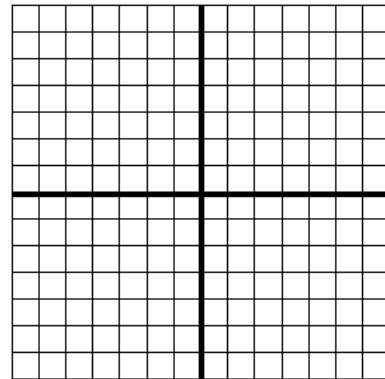
d)  $y = -\frac{x}{2}$

slope:

y-intercept:

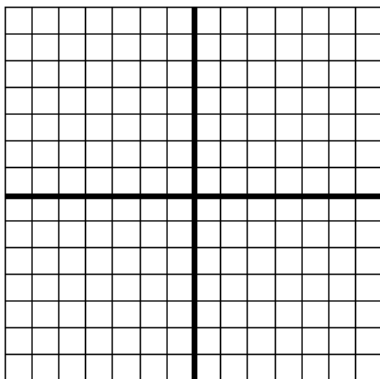


c)  $y = \frac{7}{2}$

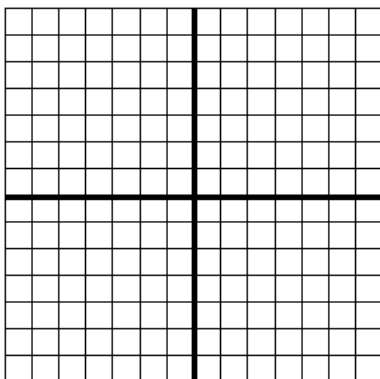


7. State the slope and the y-intercept of each line, if they exist. Then graph each line.

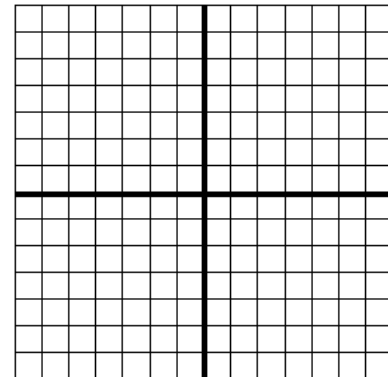
a)  $y = -5$



b)  $x = 1$



d)  $x = -2.5$



## Answers

1.

	Equation	Slope	y-Intercept
a)	$y = 4x + 1$	4	1
b)	$y = \frac{x}{2} - 3$	$\frac{1}{2}$	-3
c)	$y = -2x$	-2	0
d)	$y = -x + 2$	-1	2

2. a) -3; 6

b)  $\frac{1}{2}$ ; 2

c)  $-\frac{2}{5}$ ; -2

d)  $\frac{3}{5}$ ; 3

3. a)  $y = -3x + 6$

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

c)  $y = -\frac{2}{5}x - 2$

d)  $y = \frac{3}{5}x + 3$

4. a)  $y = x - 3$

b)  $y = -6x + 6$

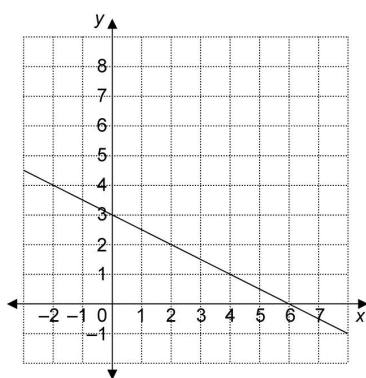
5. a)  $y = -2x + 1$

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

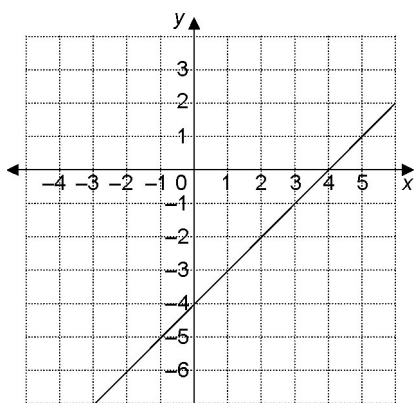
c)  $y = 5x$

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

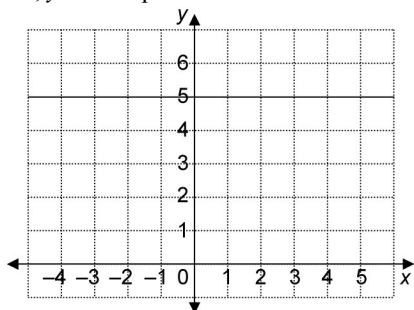
6. a) slope  $-\frac{1}{2}$ ; y-intercept 3



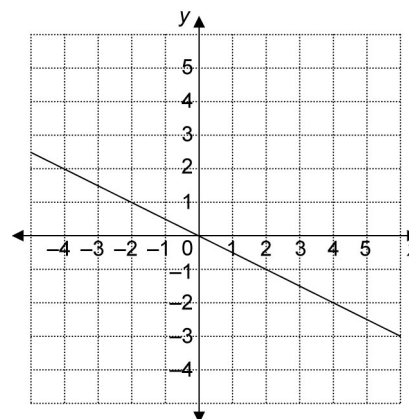
b) slope 1; y-intercept -4



c) slope 0; y-intercept 5



d) slope  $-\frac{1}{2}$ ; y-intercept 0

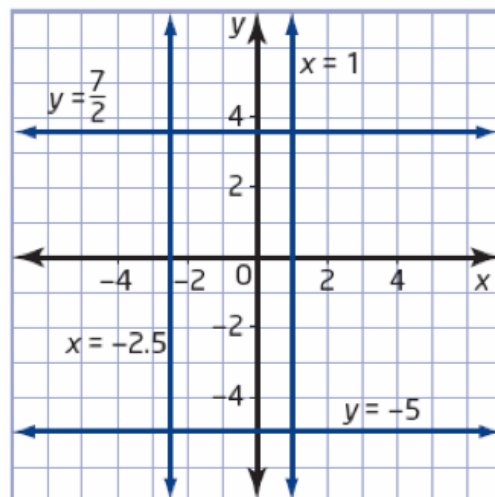


7. a) The slope is 0, and the y-intercept is -5.

b) The slope is undefined, and there is no y-intercept.

c) The slope is 0, and the y-intercept is  $\frac{7}{2}$ .

d) The slope is undefined, and there is no y-intercept.



## 6.2 Standard Form Worksheet

MPM1D

Jensen

1. Express each equation in the form  $y = mx + b$

a)  $x + y - 3 = 0$

b)  $2x + 3y + 6 = 0$

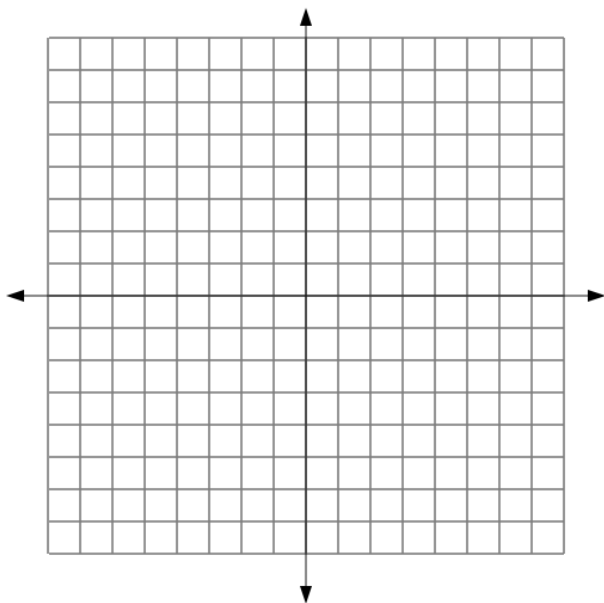
c)  $x - 4y + 12 = 0$

d)  $3x + 2y - 5 = 0$

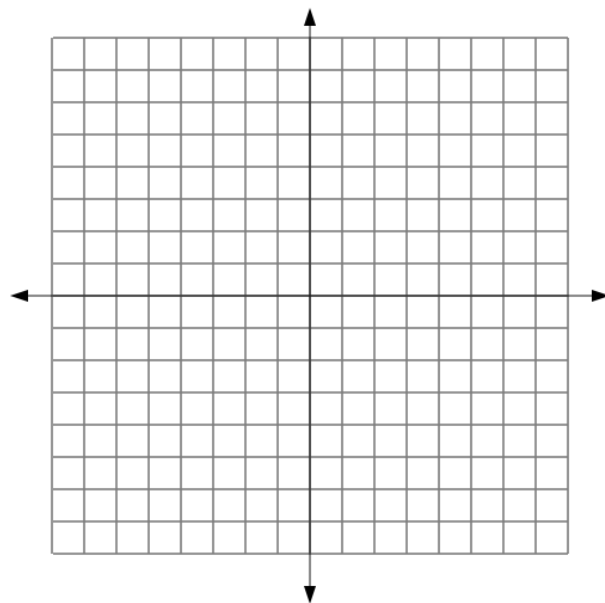
2. For each linear relation in question 1,

- Identify the slope and the y-intercept
- Use this information to graph the line

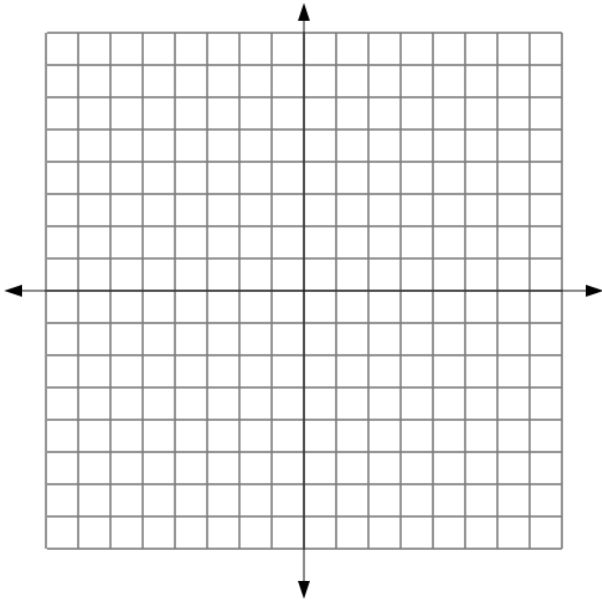
a)



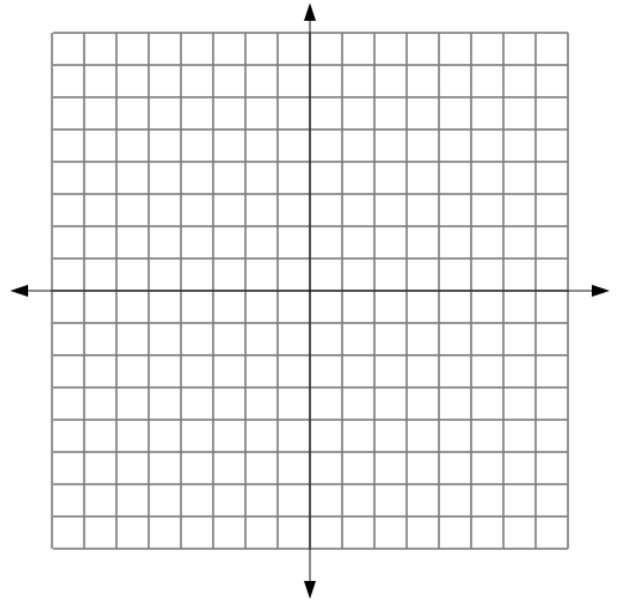
b)



c)



d)



3. Identify the slope and the y-intercept of each line.

a)  $x + 3y - 3 = 0$

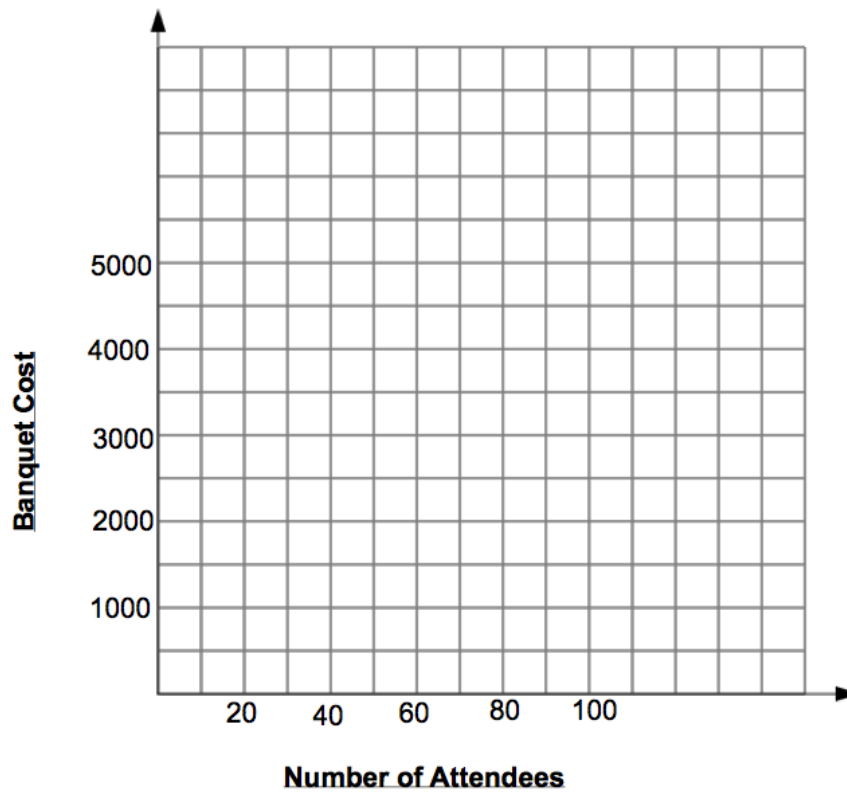
b)  $2x - 5y + 8 = 0$

4. The Easy Event banquet hall charges according to the equation  $40n - C + 250 = 0$

a) Express the equation in slope y-intercept form:  $C = mn + b$

b) Identify the fixed and variable costs.

c) Illustrate the relation graphically



d) What is the rental cost if 100 people attend a soccer banquet?

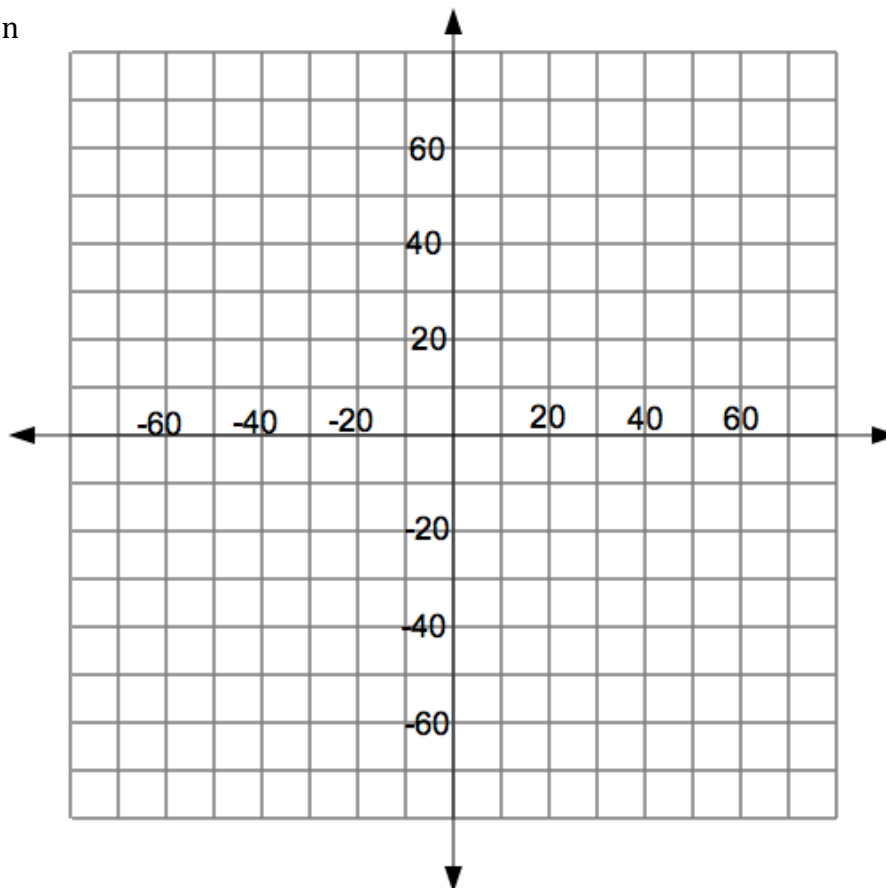


5. There are a lot of factories in the Jean's home city. The equation  $n - E + 15 = 0$  describes how much a worker might earn,  $E$ , in dollars per hour, according to the number of years experience,  $n$ . Find the hourly earnings of a beginning factory worker, and of a worker with 5 years experience.

6. The equation  $9C - 5F + 160 = 0$  describes the relationship between temperature,  $C$ , in degrees Celsius, and temperature,  $F$ , in degrees Fahrenheit.

a) Express this equation in the form  $C = mf + b$

b) Graph this relation



c) Identify the slope and the C-intercept and explain what they mean.

7. The Knights Banquet Hall uses the equation  $25n - C + 1250 = 0$  to determine the cost for a hall rental. The Legions Banquet Hall uses the equation  $30n + 995 - C = 0$  to determine the cost for their hall rental. In each case,  $C$  represents the cost, in dollars, which depends on  $n$ , the number of people attending.

a) Express each equation in slope y-intercept form:  $C = mn + b$

b) Identify the fixed and variable costs for each hall.

c) What is the cost at each hall for a graduation banquet for 45 people?

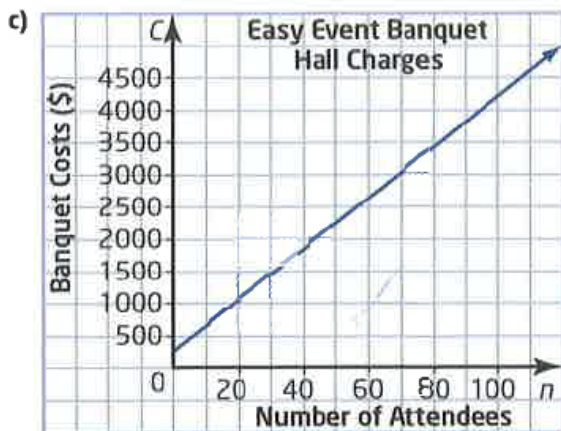
**8. [BONUS]** You can change an equation from slope y-intercept form to standard form by rearranging terms in the equation. Rearrange each of the following equation into standard form.  $Ax + By + c = 0$ , and identify the coefficients A, B, and C. Hint: In standard form, the coefficient of the x-term is always positive and there are no fractions.

a)  $y = -2x + 7$

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

## Answers:

1. a)  $y = -x + 3$                       b)  $y = -\frac{2}{3}x - 2$   
 c)  $y = \frac{1}{4}x + 3$                       d)  $y = -\frac{3}{2}x + \frac{5}{2}$
2. a) slope  $-1$ ;  $y$ -intercept  $3$ ; the graph is a line crossing the  $y$ -axis at  $3$  and the  $x$ -axis at  $3$ .  
 b) slope  $-\frac{2}{3}$ ;  $y$ -intercept  $-2$ ; the graph is a line crossing the  $y$ -axis at  $-2$  and the  $x$ -axis at  $-3$ .  
 c) slope  $\frac{1}{4}$ ;  $y$ -intercept  $3$ ; the graph is a line crossing the  $y$ -axis at  $3$  and passing through  $(4, 4)$ .  
 d) slope  $-\frac{3}{2}$ ;  $y$ -intercept  $\frac{5}{2}$ ; the graph is a line crossing the  $y$ -axis at  $2\frac{1}{2}$  and passing through  $(3, -2)$ .
3. a) slope  $-\frac{1}{3}$ ;  $y$ -intercept  $1$   
 b) slope  $\frac{2}{5}$ ;  $y$ -intercept  $\frac{8}{5}$
4. a)  $C = 40n + 250$   
 b) fixed cost \$250; variable cost \$40 per person

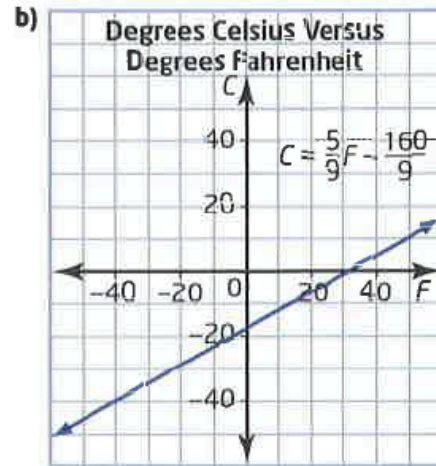


d) \$4250

5. \$15, \$20

6.

a)  $C = \frac{5}{9}F - \frac{160}{9}$



c) The slope is  $\frac{5}{9}$  and the  $C$ -intercept is  $-\frac{160}{9}$ . The slope is a multiplication coefficient and the  $C$ -intercept is a constant. To change a Fahrenheit temperature to a Celsius temperature, multiply the Fahrenheit temperature by the slope and add the  $C$ -intercept.

7. a)  $C = 25n + 1250$ ;  $C = 30n + 995$

b) Knights: fixed = 1250, variable=25

Legions: fixed=995, variable=30

c) Knights=\$2375 ; Legions=\$2345

8. a)  $2x+y-7=0$ ;  $A=2$ ,  $B=1$ ,  $C=-7$

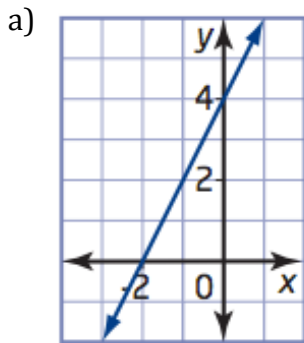
b)  $3x-4y-8=0$ ;  $A=3$ ,  $B=-4$ ,  $C=-8$

## 6.3 Graphing Using Intercepts Worksheet

MPM1D

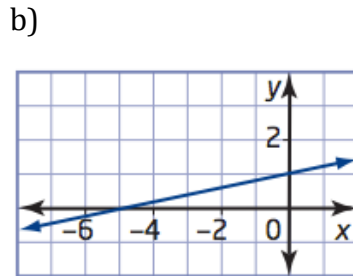
Jensen

1. Identify the x- and y-intercepts of each graph, if they exist.



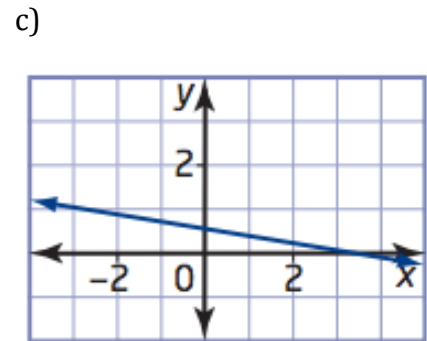
x-intercept:

y-intercept:



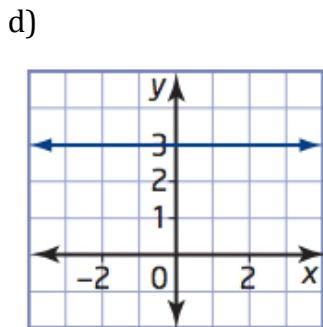
x-intercept:

y-intercept:



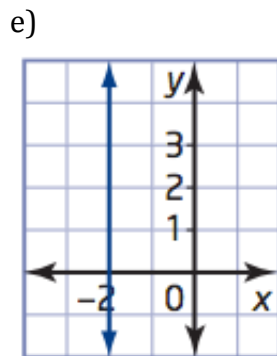
x-intercept:

y-intercept:



x-intercept:

y-intercept:

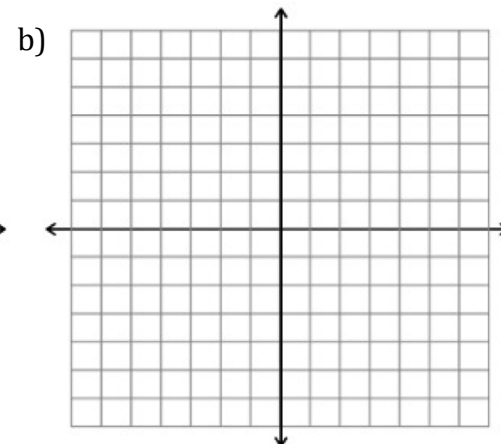
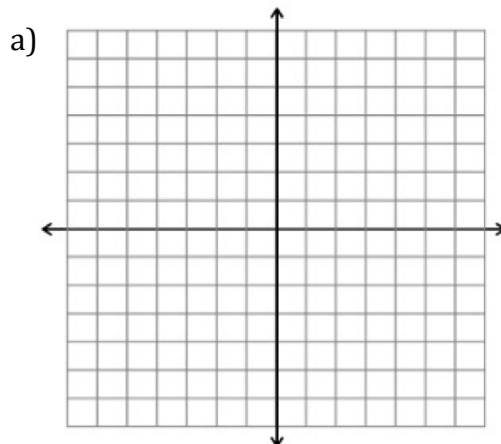


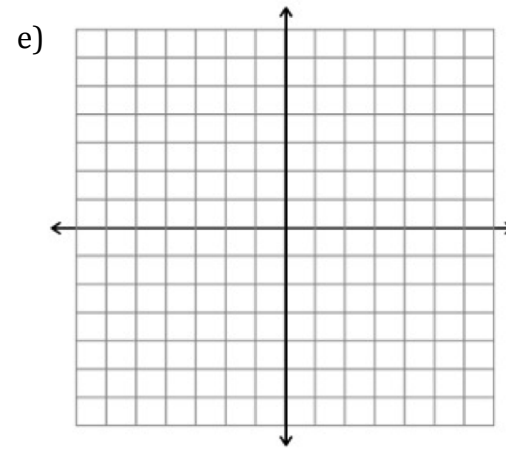
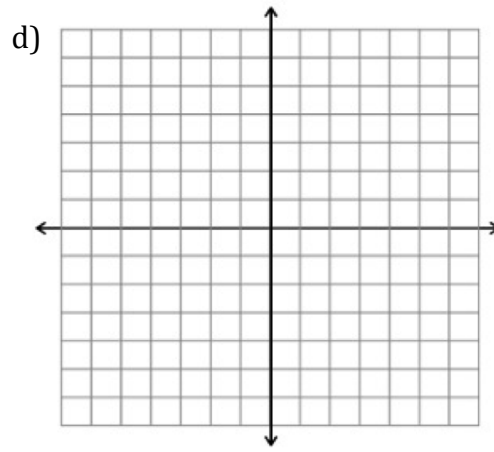
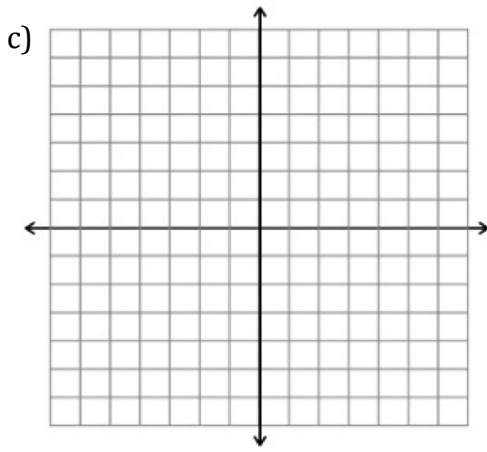
x-intercept:

y-intercept:

2. For each part, plot the intercepts and graph the line

	x-intercept	y-intercept
a)	2	5
b)	-3	3
c)	1.5	-4
d)	none	6
e)	4	none





3. Determine the x- and y-intercepts and use them to graph the line

a)  $2x + 3y = 12$

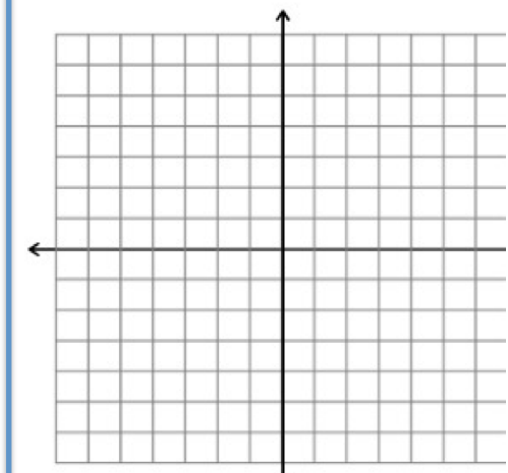
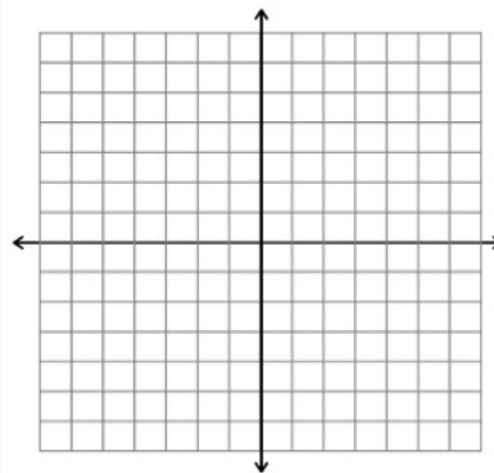
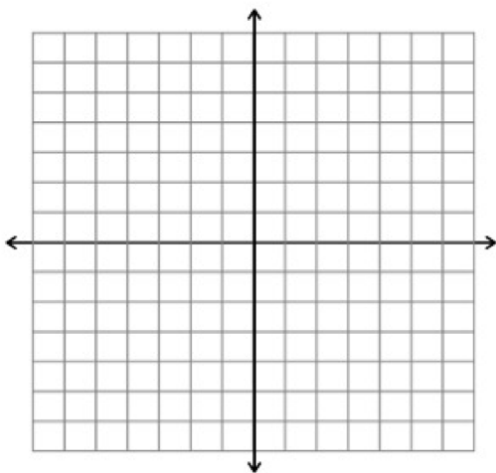
b)  $3x + y = 6$

c)  $x - 4y = 4$

x-intercept: _____ y-intercept: _____
--

x-intercept: _____ y-intercept: _____
--

x-intercept: _____ y-intercept: _____
--



d)  $-5x + 2y = 10$

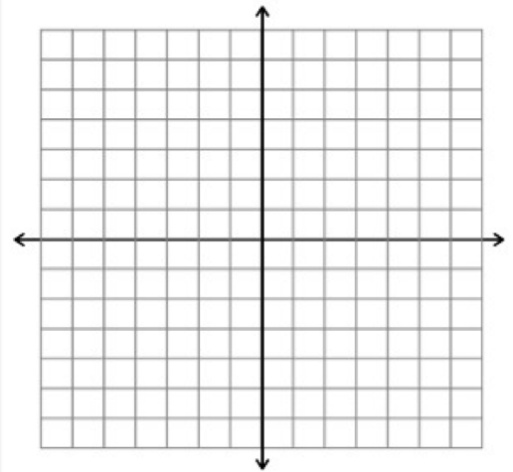
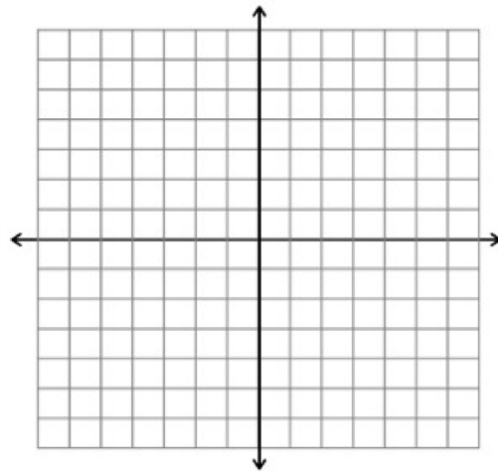
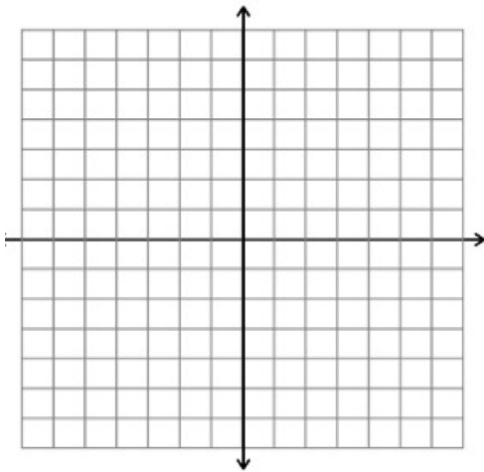
e)  $4x = 12$

g)  $4x + 2y = 6$

x-intercept: \_\_\_\_\_  
y-intercept: \_\_\_\_\_

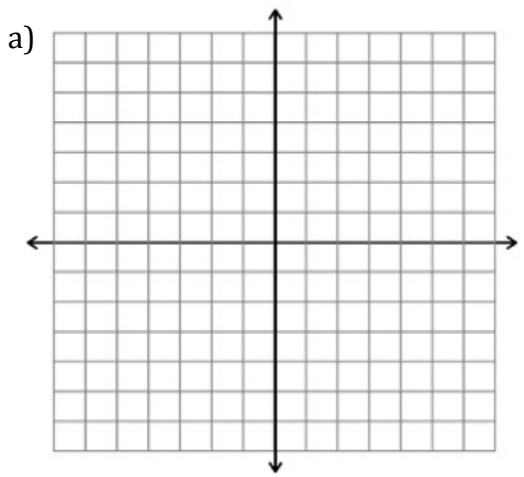
x-intercept: \_\_\_\_\_  
y-intercept: \_\_\_\_\_

x-intercept: \_\_\_\_\_  
y-intercept: \_\_\_\_\_

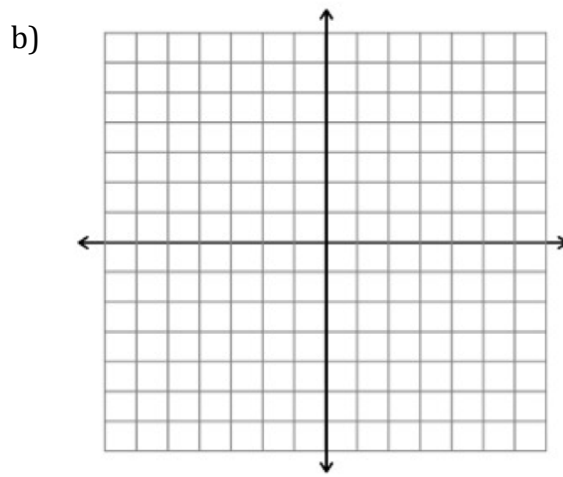


4. Draw a graph and determine the slope of each line using the rise and run from the graph.

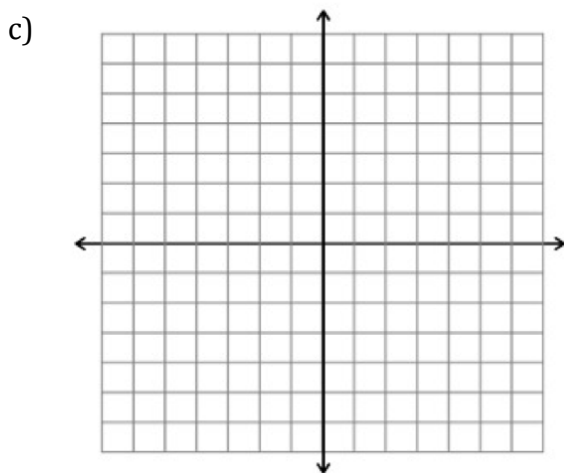
	x-intercept	y-intercept
a)	5	-5
b)	-2	3
c)	3	none
d)	2.5	-4



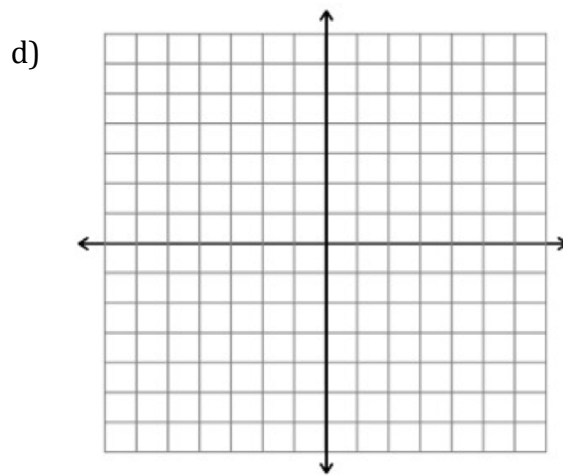
Slope: \_\_\_\_\_



Slope: \_\_\_\_\_



Slope: \_\_\_\_\_



Slope: \_\_\_\_\_

5. Find the slope of each line using the slope formula

	x-intercept	y-intercept
a)	6	5
b)	3	-4
c)	-6	3
d)	none	$\frac{1}{2}$

a)

Slope: \_\_\_\_\_



b)

c)

d)

Slope: \_\_\_\_\_

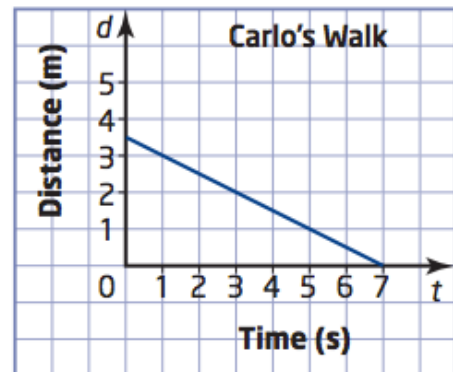
Slope: \_\_\_\_\_

Slope: \_\_\_\_\_

6. The distance time graph shows Carlo's motion in front of a sensor.

a) Identify the d-intercept and explain what it means

b) Identify the t-intercept and explain what it means



c) Describe the instructions you would give someone walking in front of a sensor to reproduce this graph

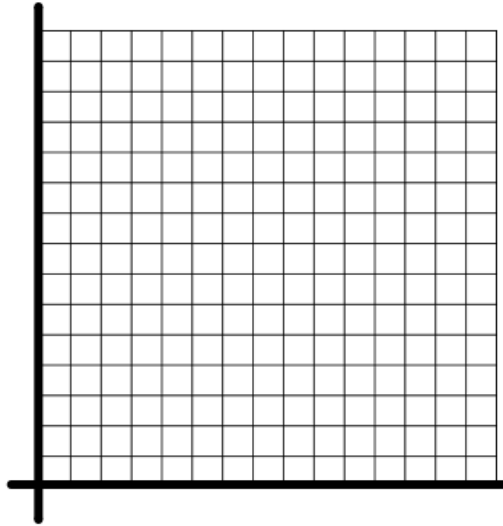
7. Consider the line  $x + 4y = -4$ . To graph this line, you could:

- determine the  $x$ - and  $y$ -intercepts
- create a table of values
- use the equation to find the coordinates of three points on the line

Which method of graphing do you prefer in this case? Explain.

8. A candle burns at a constant rate of 2.5 cm/h. The candle is 15 cm tall when it is first lit.

a) Set up a graph of length,  $l$ , in centimeters, versus time,  $t$ , in hours, and plot the  $l$ -intercept.



b) Should the slope of this linear relation be positive or negative? Explain.

c) Graph the line

d) What is the length of the candle after 3 hours? 4.5 hours?

e) Identify the  $t$ -intercept and explain what it means.

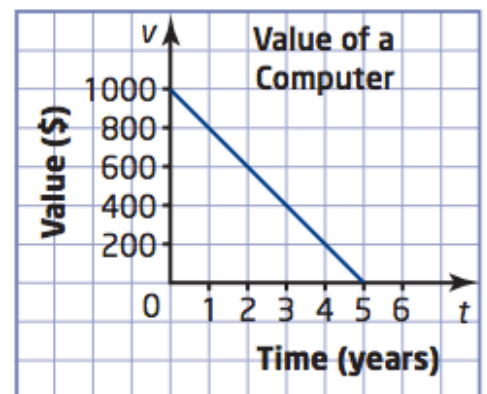
f) Explain why this graph has no meaning below the  $t$ -intercept

11. When you buy a computer, its value depreciates (becomes less) over time. The graph illustrates the value of a computer from the time it was bought.

a) How much did the computer originally cost?

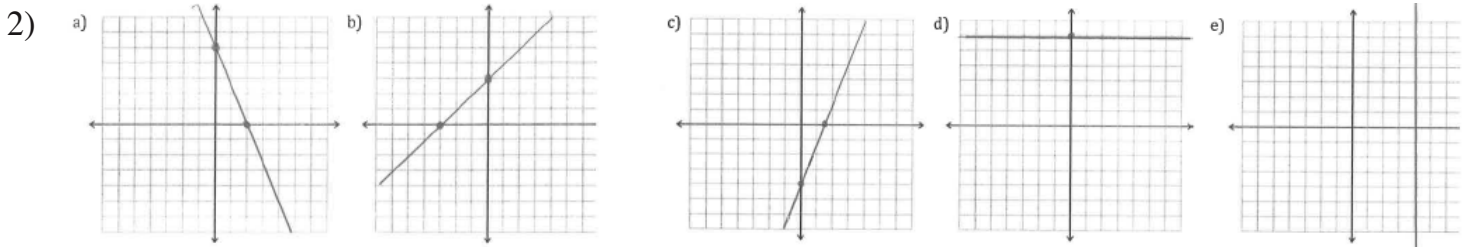
b) After what period of time does the computer no longer have value?

c) What is the slope and what does it mean?



## Answers

- 1) a) x-int  $(-2, 0)$  and y-int  $(0, 4)$  b) x-int  $(-5, 0)$  and y-int  $(0, 1)$  c) x-int  $(2.5, 0)$  and y-int  $(0, 0.5)$   
 d) no x-int and y-int  $(0, 3)$  e) x-int  $(-2, 0)$  and no y-int



- 3) a) x-int  $(6, 0)$  and y-int  $(0, 4)$  b) x-int  $(2, 0)$  and y-int  $(0, 6)$  c) x-int  $(4, 0)$  and y-int  $(0, -1)$   
 d) x-int  $(-2, 0)$  and y-int  $(0, 5)$  e) x-int  $(3, 0)$  and no y-int f) x-int  $(1.5, 0)$  and y-int  $(0, 3)$

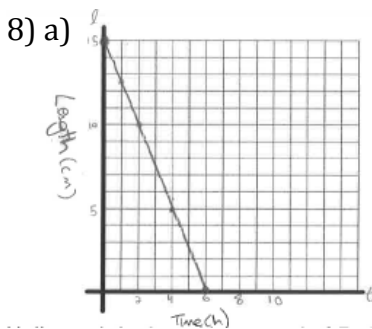
- 4) a)  $m=1$  b)  $m = \frac{3}{2}$  c) undefined d)  $m = \frac{8}{5}$

- 5) a)  $m = -\frac{5}{6}$  b)  $m = \frac{4}{3}$  c)  $m = \frac{1}{2}$  d)  $m = 0$

- 6) a) 3.5; he started 3.5 m away from the sensor b) 7; it took Carlo 7 seconds to reach the sensor

c) Walk at a constant rate of 0.5 m/s towards the sensor

- 7) x- and y-intercepts because it is not in slope y-intercept form.



b) negative because the length will decrease with time

d) after 3 hours the length is 7.5 cm; after 4.5 hours the length is 3.75 cm

e) 6; this is how long it takes for the entire candle to burn

f) The candle is gone

- 11) a) \$1000 b) 5 years c) -200; the value decreases by \$200/year

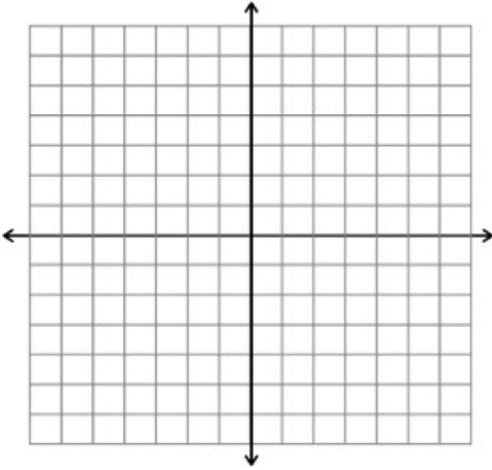
## 6.4 Parallel and Perpendicular Lines Worksheet

MPM1D

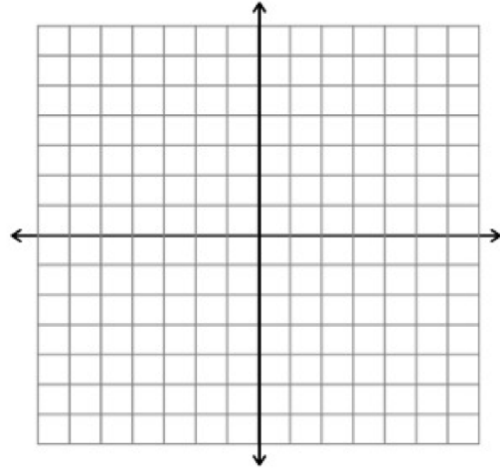
Jensen

1. Graph each pair of lines on the same coordinate grid. Find their slopes and conclude whether the lines are parallel, perpendicular, or neither.

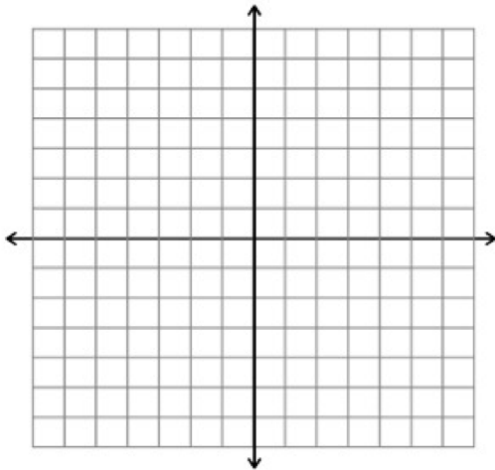
a)  $y = \frac{1}{4}x - 2$        $y = \frac{1}{4}x + 3$



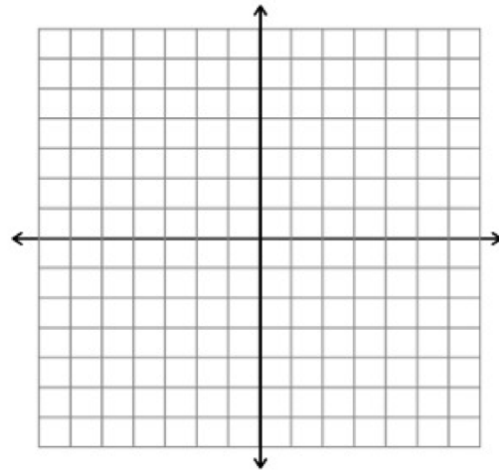
b)  $y = 2x + 5$        $4x - 2y + 6 = 0$



c)  $x + y = 4$        $y = x - 3$



d)  $y = \frac{1}{2}x - 4$        $x - 2y + 1 = 0$



3. The slopes of two lines are given. Conclude whether the lines are parallel, perpendicular, or neither. Justify your answers

a)  $m = \frac{2}{3}, m = \frac{4}{6}$

b)  $m = \frac{3}{4}, m = -\frac{4}{3}$

c)  $m = 2, m = -2$

d)  $m = 1, m = -1$

e)  $m = \frac{1}{5}, m = 0.2$

f)  $m = 2\frac{1}{4}, m = -\frac{4}{9}$

4. What is the slope of a line that is parallel to each line?

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

b)  $y = -x + 7$

c)  $2x - y + 3 = 0$

d)  $4x + 3y = 12$

e)  $y = 2$

f)  $x = -5$

5. For each line in question 4, give the slope of a perpendicular line.

a)

b)

c)

d)

e)

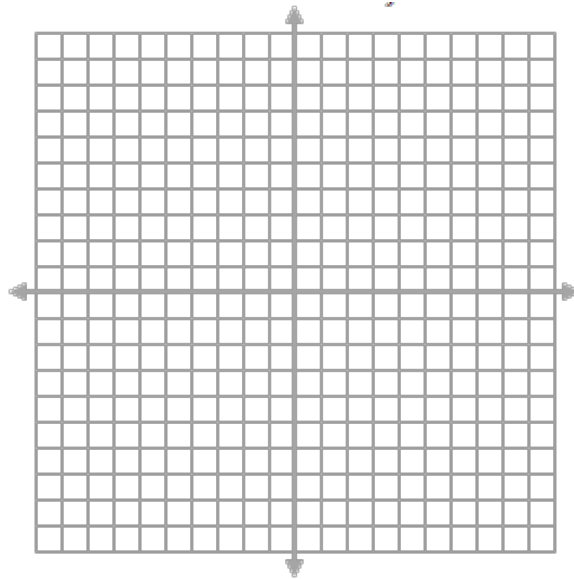
f)

6. Write the equations of two lines that are parallel to the line  $3x - 6y - 5 = 0$

7. Write the equations of two lines that are perpendicular to the line  $4x + y - 2 = 0$

8. A triangle has vertices A(1, 2), B(3, 8), and C(6, 7).

a) Plot these points and draw the triangle.



b) Does this appear to be a right triangle? Explain.

c) Find the slopes of the line segments that form this triangle.

d) Explain how the slopes can be used to conclude whether or not this is a right triangle. Is it?

9. Determine whether or not the following sets of points form right triangles. Justify your answers with mathematical reasoning.

a)  $A(1, 1)$ ,  $B(-2, 5)$ ,  $C(3, -2)$

b)  $P(2, 4)$ ,  $Q(-2, 2)$ ,  $R(5, -2)$

## Answers:

1) a) parallel b) Parallel c) Perpendicular d) Parallel

3) a) parallel b) perpendicular d) perpendicular e) parallel

4) a)  $m = \frac{3}{5}$  b)  $m = -1$  d)  $m = \frac{-4}{3}$  e)  $m = 0$

5) a)  $m = \frac{-5}{3}$  b)  $m = 1$  d)  $m = \frac{3}{4}$  e) undefined

6) Any two lines with a slope of  $\frac{1}{2}$ . Examples:  $y = \frac{1}{2}x + 99$  and  $y = \frac{1}{2}x + 87$

7) Any two lines with a slope of  $\frac{1}{4}$ . Examples:  $y = \frac{1}{4}x + 71$  and  $y = \frac{1}{4}x + 87$

8) b) It appears vertex B might be a 90 degree angle c)  $m_{AB} = 3, m_{BC} = \frac{-1}{3}, m_{AC} = 1$

d)  $m_{AB} \times m_{BC} = -1$ , therefore AB and BC are perpendicular

9) a) Not a right triangle b) PQ and PR form a right angle



## 6.5 – Slope and a Point

MPM1D

Jensen

1. Find the equation of a line with the given slope and passing through the given point, P.

a)  $m = 1, P(3, 5)$

b)  $m = -3, P(0, -4)$

c)  $m = \frac{2}{3}, P(-2, 6)$

d)  $m = \frac{-1}{2}, P(5, -2)$

e)  $m = -\frac{4}{5}, P(0, 0)$

f)  $m = 2, P(\frac{1}{2}, \frac{3}{4})$

2. Find the equation of a line:

a) with a slope of -3, passing through the origin

b) Parallel to  $y = \frac{2}{3}x + 5$ , passing through  $(4, -5)$

c) Parallel to the x-axis, passing through  $(3, -6)$

d) Perpendicular to  $y = -\frac{2}{5}x + 4$ , passing through the origin

e) Perpendicular to  $x = -2$ , passing through the point  $(1, -3)$

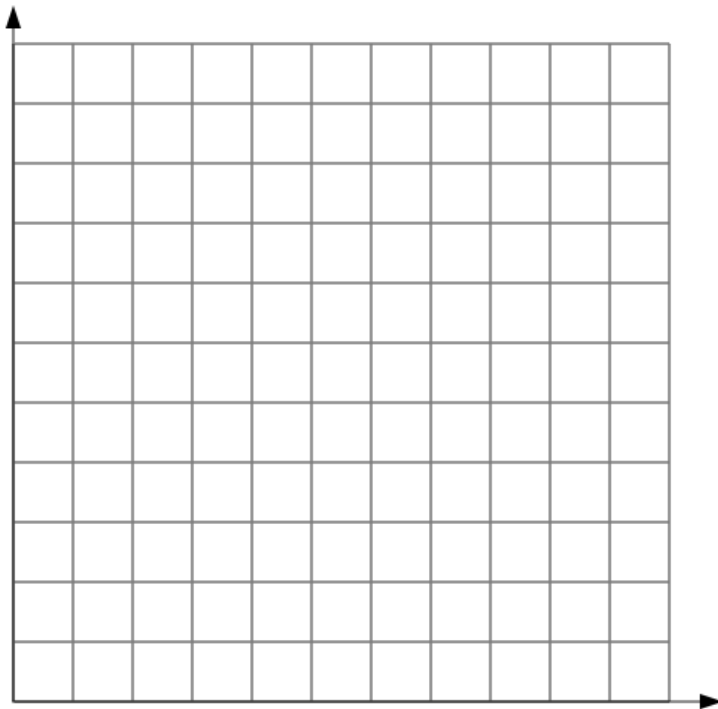
f) Perpendicular to  $y = 4x - 3$ , passing through the point  $(-2, 7)$

3. In Niagara-on-the-Lake, you can ride a horse-drawn carriage for a fixed price plus a variable amount that depends on the length of the trip. The variable cost is \$10/km and a 2.5-km trip costs \$40.

a) Determine the equation relating cost,  $C$ , in dollars, and distance,  $d$ , in kilometers.

b) Use your equation to find the cost of a 6.5-km ride.

c) Graph this relation



d) Use your graph to find the cost of a 6.5 km ride.

4. Find an equation for the line parallel to  $2x - 3y + 6 = 0$ , with the same y-intercept as  $y = 7x - 1$ .
5. Find an equation for the line perpendicular to  $4x - 5y = 20$  and sharing the same y-intercept.
6. Jean's home city is one of the best designed in North America for traffic flow, Traffic lights are carefully programmed to keep cars moving. Some lanes on one-way streets change direction depending on the time of day. Find the x- and y-intercepts of the line that is perpendicular to  $y = \frac{9}{8}x + 1$  and passes through the point  $(18, -8)$ .

7. Aki has been driving at an average speed of 80 km/h toward Ottawa for 3 hours, when he sees the sign shown.



The equation relating distance and time is of the form  $d = mt + b$

a) What does the ordered pair (3, 300) mean?

b) The slope is  $m = -80$ . What does this value represent? Why is it negative?

c) Determine the value of  $b$ .

d) Write an equation relating distance and time.

e) How long will the trip to Ottawa take, in total?

8. A city taxi charges \$2.50/km plus a fixed cost. A 6-km taxi ride costs \$22.

a) Find the fixed cost.

b) Write the equation relating cost,  $C$ , in dollars, and distance,  $d$ , in kilometers.

## Answers

1. a)  $y = x + 2$     b)  $y = -3x - 4$     c)  $y = \frac{2}{3}x + \frac{22}{3}$   
 d)  $y = -\frac{1}{2}x + \frac{1}{2}$     e)  $y = -\frac{4}{5}x$     f)  $y = 2x - \frac{1}{4}$   
 2. a)  $y = -3x$     b)  $y = \frac{2}{3}x - \frac{23}{3}$     c)  $y = -6$   
 d)  $y = \frac{5}{2}x$     e)  $y = -3$     f)  $y = -\frac{1}{4}x + \frac{13}{2}$

4.  $y = \frac{2}{3}x - 1$

5.  $y = -\frac{5}{4}x - 4$

6. x-intercept 9 ; y-intercept 8

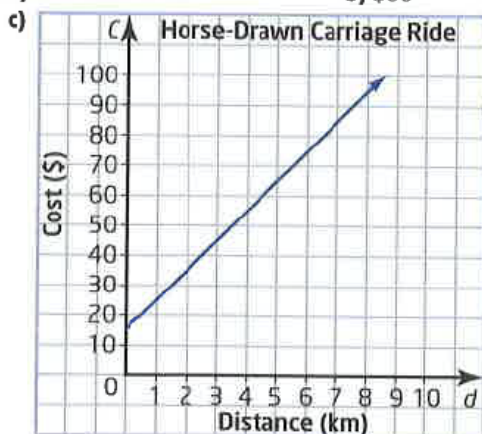
7. a) After 3 hours of driving toward Ottawa, Aki has 300 km left to drive.

b) This value shows that for each hour that Aki drives, his distance from Ottawa decreases by 80 km. It is negative because it represents a decreasing distance per hour.

c) 540    d)  $d = -80t + 540$     e) 6.75 hours

8. a) 7    b)  $C = 2.5d + 7$

3. a)  $C = 10d + 15$     b) \$80



d) \$80

## 6.6 Find an Equation for a Line Given Two Points Worksheet

MPM1D

Jensen

1. Find the equation for the line passing through each pair of points

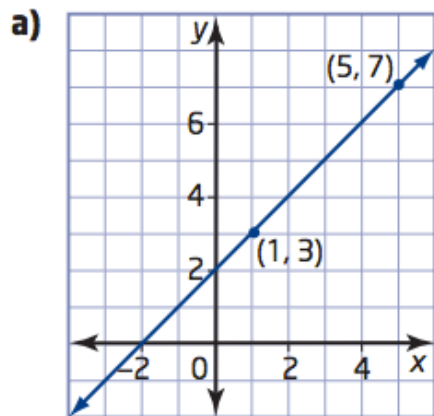
a) P(2,3) and Q(5,6)

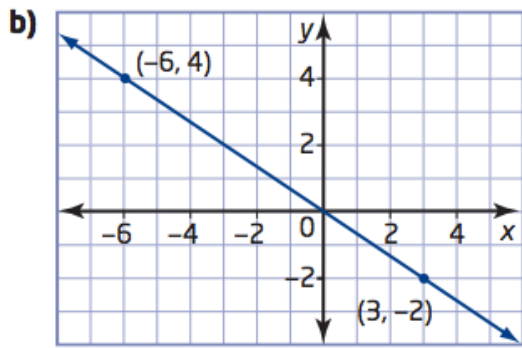
b) A(4,-1) and B(0,5)

c) U(-3,4) and V(-2,-6)

d)  $L\left(\frac{1}{2}, 0\right)$  and  $M\left(\frac{7}{2}, -5\right)$

2. Find the equation for each line





3. a) Find an equation for the line with an  $x$ -intercept of 4 and a  $y$ -intercept of -2.

b) Find an equation for the line whose  $x$ - and  $y$ -intercepts are both -5

4. Find the equation of a line passing through each pair of points.

a) M(0,3) and N(5,3)



b) K(-2,6) and L(-2,-4)

5. A bowling alley has a fixed base cost and charges a variable per game rate. It costs \$20.50 for five games and \$28.50 for nine games

a) What is the variable cost (slope)

b) Find an equation for the line relating,  $C$ , in dollars, and number of games,  $g$ , in the form  $C = mg + b$

d) What is the  $C$ -intercept? What does it mean?

f) Use the equation to find the cost of 20 games

6. Fiona is walking at a constant speed in front of a motion sensor. After 2 s, she is 1.5 m from the sensor. 2 s later, she is 4.5 m from the sensor.

a) Is Fiona moving toward or away from the sensor? How do you know?

b) How fast is Fiona walking? (find the slope)

c) Find the equation that describes Fiona's motion in the form  $d = mt + b$

d) What is the d-intercept and what does it represent?

7. Workers at a laboratory get the same raise each year. Colette, who has been working at the lab for 5 years, earns \$17.25/h. Lee, who has been working at the lab for 1 year, earns \$14.25/h. The equation relating wage and number of years worked is of the form  $w = mn + b$ , where  $w$  is the hourly wage and  $n$  is the number of years worked.

a) (5, 17.25) and (1, 14.25) are two points on the line. Explain why.

b) Find the slope and the  $w$ -intercept of this line, and explain what they mean.

c) Write the equation of the line

d) Maria has been working at the lab for 7 years. Determine her hourly wage.

e) What wage does the linear model predict for a worker who has been with the lab for 25 years? Does this seem reasonable? Explain.

8. Anil's family is driving home to Toronto. Anil hopes that they will make it back in time to see the hockey game on television. While travelling at a fairly constant speed, he observes two signs along the trip.

a) How fast Anil's family travelling?

At 4:30 P.M.:

Toronto 240 km

At 7:00 P.M.:

Toronto 40 km

b) Find a linear equation that relates distance from home, in kilometers, to time travelled, in hours.

c) The game starts at 7:45 P.M. Will they make it back to Toronto in time? If yes, how much spare time will Anil have to make it to the TV? If not, how late will he be? What assumptions must you make

## Answers:

1) a)  $y = x + 1$  b)  $y = \frac{-3}{2}x + 5$  c)  $y = -10x - 26$  d)  $y = \frac{-5}{3}x + \frac{5}{6}$

2) a)  $y = x + 2$  b)  $y = \frac{-2}{3}x$

3) a)  $y = \frac{1}{2}x - 2$  b)  $y = -x - 5$

4) a)  $y = 3$  b)  $x = -2$

5) a)  $m=2$  b)  $C = 2g + 10.5$  d) (0,10.5) f) \$50.50

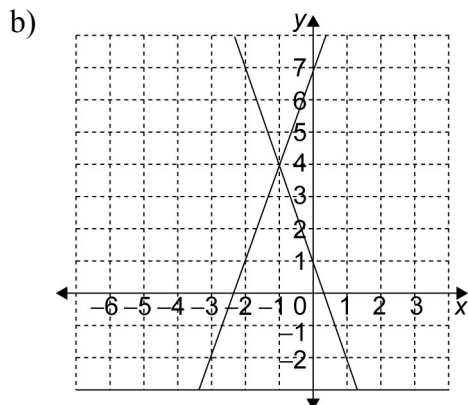
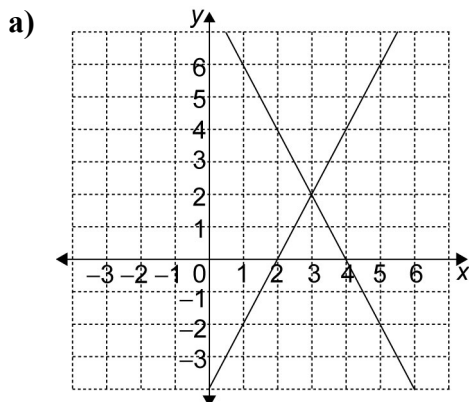
6) a) away b) 1.5 m/s c)  $d = 1.5t - 1.5$  d) -1.5, this means her initial position was 1.5 m behind the sensor

7) a) x-coordinate=years experience, y-coordinate=wage b)  $m=0.75$ =increase in pay per year,  $b=13.5$ =initial pay with no experience c)  $y = 0.75x + 13.5$  d) \$18.75 e) \$32.25

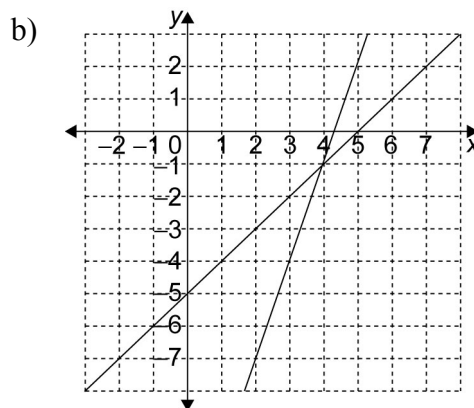
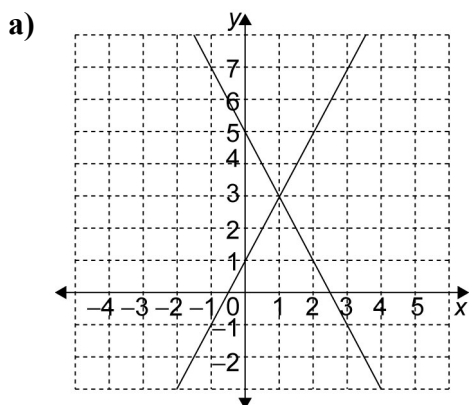
8) a) 80 km/h b)  $y = -80x + 240$  c) yes, they will have 15 minutes to spare

## 6.7 Practice: Linear Systems

1. What are the coordinates of the point of intersection of each linear system?

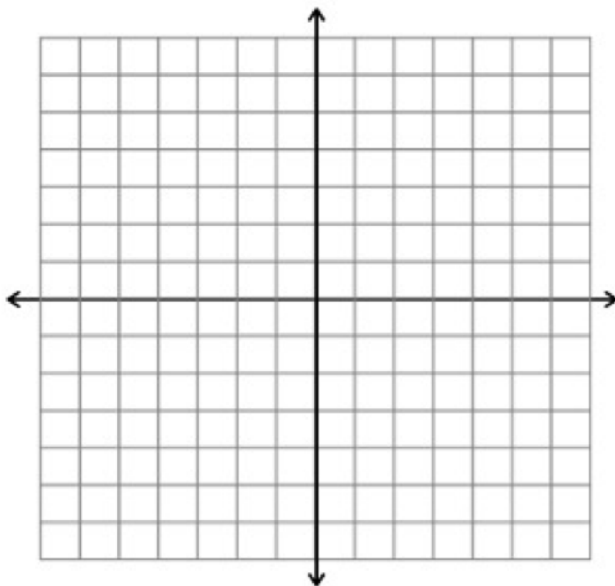


2. What is the solution to each linear system?

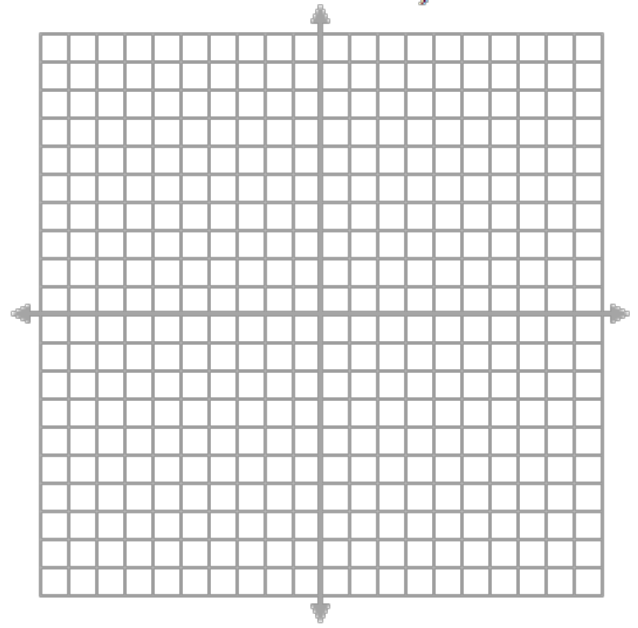


3. Solve each linear system. Check your solution in both equations.

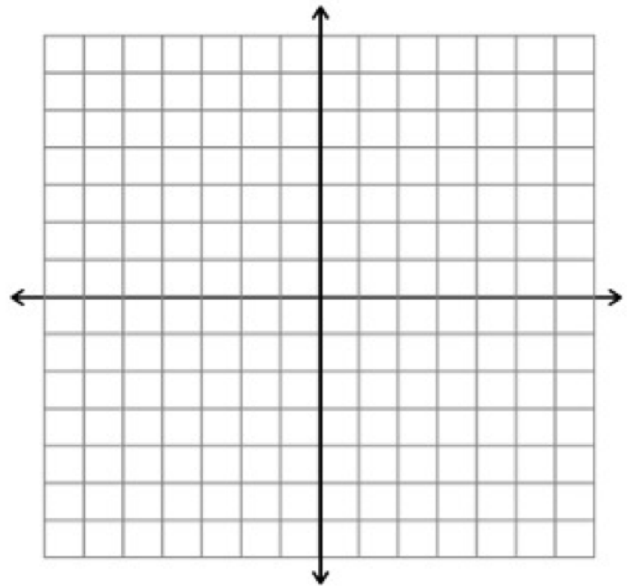
a)  $x + y = 4$  and  $y = x$



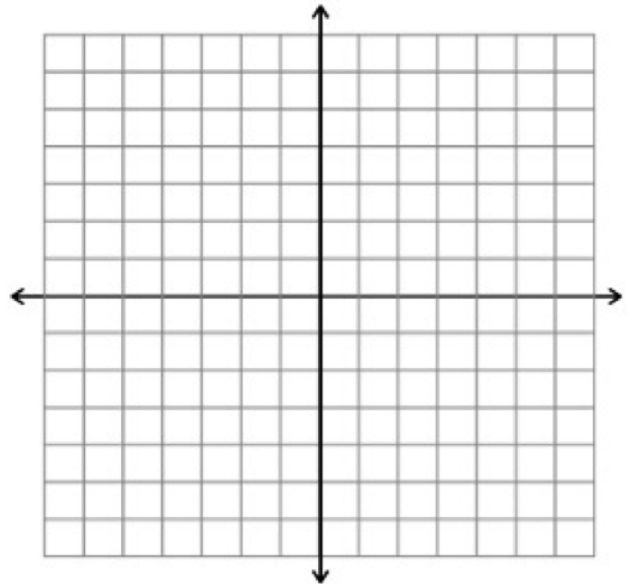
**b)**  $2x + y = 8$  and  $y = 2x$



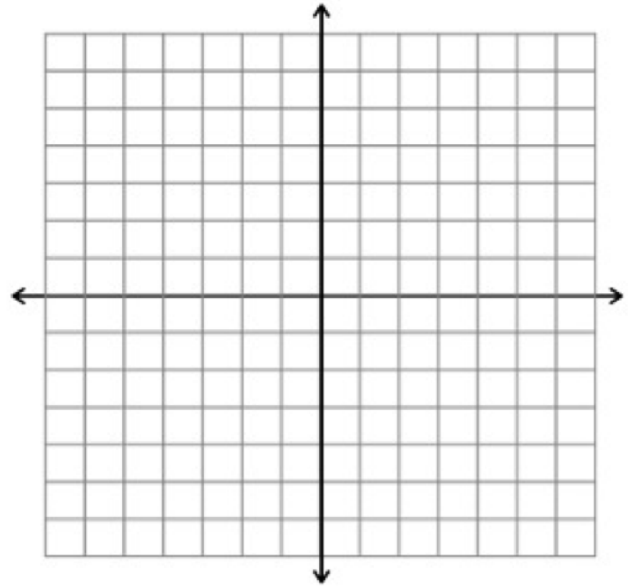
**c)**  $3x + y = 1$  and  $y = 3x + 7$



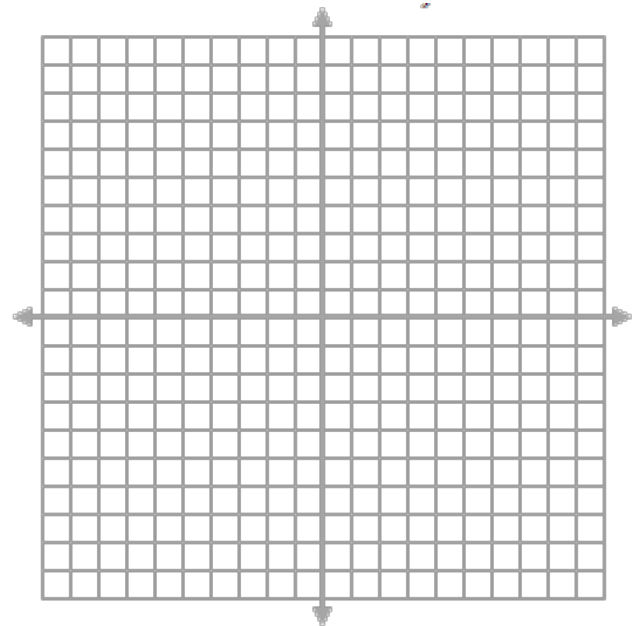
**d)**  $x + y = 3$  and  $x - y = -1$



e)  $y = -x$  and  $y = x - 6$

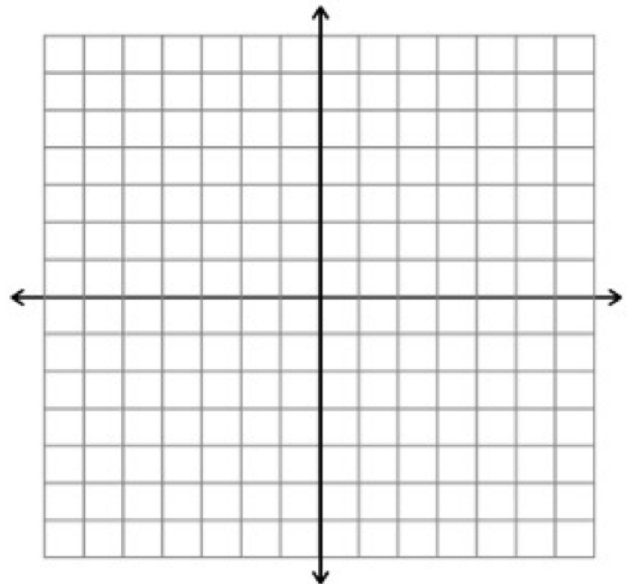


f)  $x - y = 8$  and  $x + 2y = 2$



4. Which is the point of intersection for the linear system  $y = 2x + 1$  and  $y = 3x - 1$ ? Solve graphically and check algebraically.

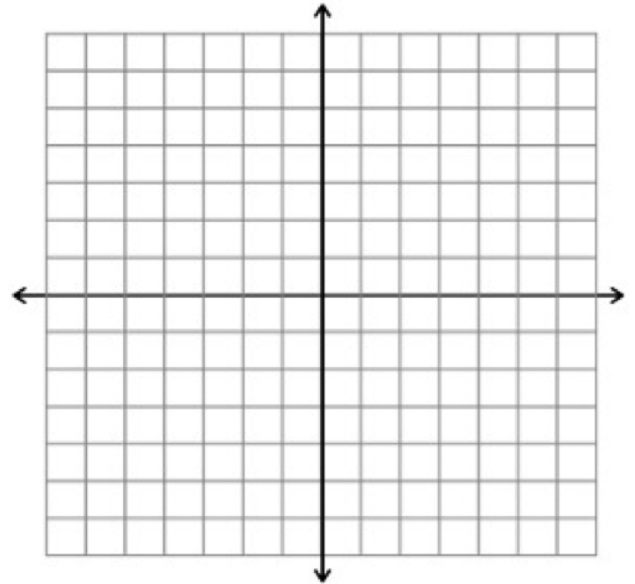
- A (2, 2)
- B (2, 5)
- C (5, 2)
- D (5, 5)



5. Which is the solution to the linear system? Solve graphically and check your answer algebraically.

$$y = 2x - 2 \text{ and } y = -\frac{1}{4}x + 7$$

- A (4, 1)
- B (4, -6)
- C (4, 6)
- D (4, -1)

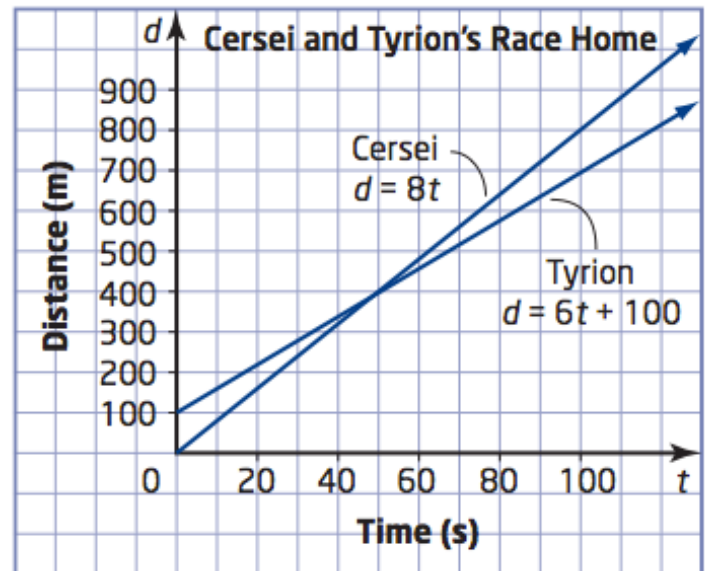


6. Cersei and her brother Tyrion decide to race home. Cersei is a faster runner than Tyrion, so she gives him a head start. Their distance- time graphs are shown.

a) How much of a head start did Tyrion get?

b) How fast does Cersei run?

c) How fast does Tyrion run?



d) For what length of race will each runner win? For what length of race will they tie?

e) Explain the significance of the solution of this linear system.



## Answers

1. a) (3, 2)      b) (-1, 4)
2. a) (1, 3)      b) (4, -1)
3. a) (2, 2)      b) (2, 4)  
c) (-1, 4)      d) (1, 2)  
e) (3, -3)      f) (6, -2)
4. B
5. C
6. a) 100 m   b) 8m/s   c) 6 m/s   d) Cersei will win if the race longer than 400 m while Tyrion will win if the race is shorter than 400 m. If the race is 400 m, then they will tie   e) The solution is (50,400). Cersei will catch Tyrion after 50 seconds at a distance of 400 m.