5 2.1A Rearranging Equations

Equations of lines generally have two variables (except _____ and _____ lines). We must often rearrange equations into _____ forms.

For all of the following, rearrange into the form

$$y = \_\_ x + \_\_$$

1. $6x + y = 2$ * isolate y   4. $5x + 2y = 7$

2. $-8x + 2y = -4$ 5. $2x - y = 7$
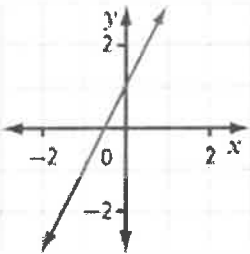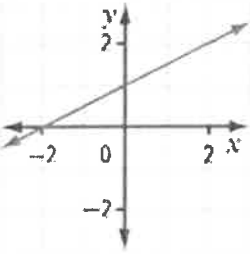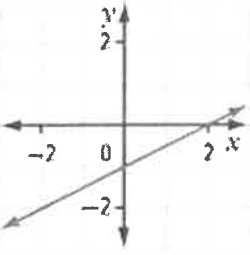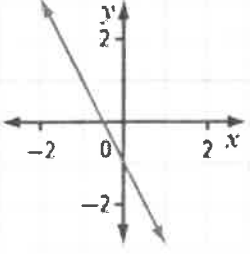
3. $-2x - 3y = 0$ 6. $-2x - 2y = -12$

Practice Work: w/s (~~38/63~~) Cryptic Quiz

5 2.1B Slope-Intercept Form

y-intercept:

slope-intercept form:

Table of Values		Graph	Slope, *m*	y-intercept, *b*	Equation, $y = mx + b$
x	**y**				
0	1				
1	3				
2	5				
x	**y**				
0	1				
2	2				
4	3				
x	**y**				
0	−1				
2	0				
4	1				
x	**y**				
0	−1				
1	−3				
2	−5				

Ex. Graph each line using the slope and *y*-intercept:
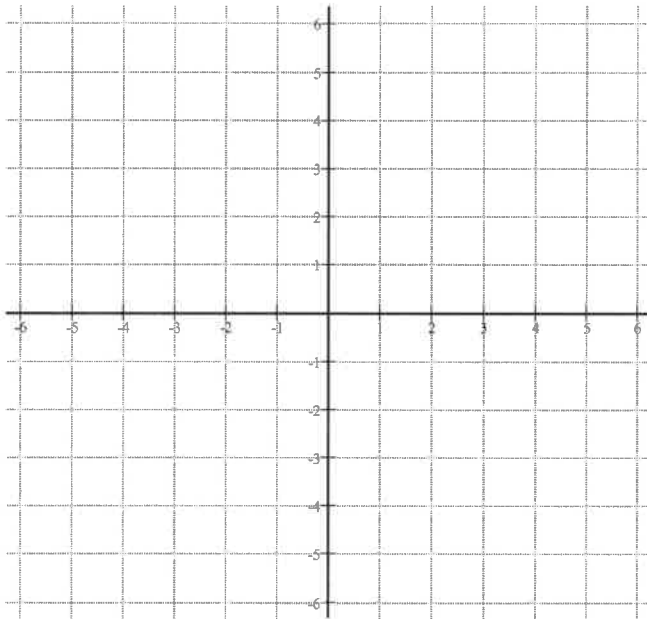
$$y = \frac{2}{3}x - 4$$

$$y = -3x + 5$$

Ex. Express each equation in slope-intercept form:

$$3x + 2y = 6 \qquad\qquad 2x - 6y - 4 = 0$$

Ex . A students' council rents a portable dunk tank as a fundraising activity. Students pay for the chance to hit a target with a ball and dunk a teacher into a tank of water. The relationship between the number of balls thrown, x, and the profit, y, in dollars, may be represented by the equation 3x − 2y − 600 = 0.

a) Rewrite the equation in slope − intercept form.

b) State the slope of the line. What does the slope represent?

c) Identify the y-intercept. What does it represent?

d) The break-even point is the point at which the money raised equals the money spent. How many balls must the students sell to reach the break-even point?

Ex. An archaeologist simulates a First Nations method of boiling water. If the starting temperature of the water is 10 °C and the equation $W = mt + 10$ models how the temperature, W, increases over time, t (min).

a) After 5 min, the water temperature is 19 °C. Determine the value of the parameter m. What does m represent?

b) How long will it take for the water to boil?

*ignore "use graphing technology to check"

5 2.1C Equations of Lines – Slope Intercept Form

To write an equation of a line, we need two things:

1. _____

2. _____

Slope – Intercept form →

Given slope and a point

1. Determine the equation of a line through (-1, 3) with a slope of $\frac{2}{3}$.

   $y = mx + b$

2. slope of m = $\frac{-1}{2}$, through point (4, -3)

Given two points on the line

1. Find the equation of the line through points (1, 4) and (4, -2)
   - Two steps
     - Calculate slope
     - Use slope and 1 point to find b.

2. Find the equation of the line through (-5, -3) with a x-intercept of 1.
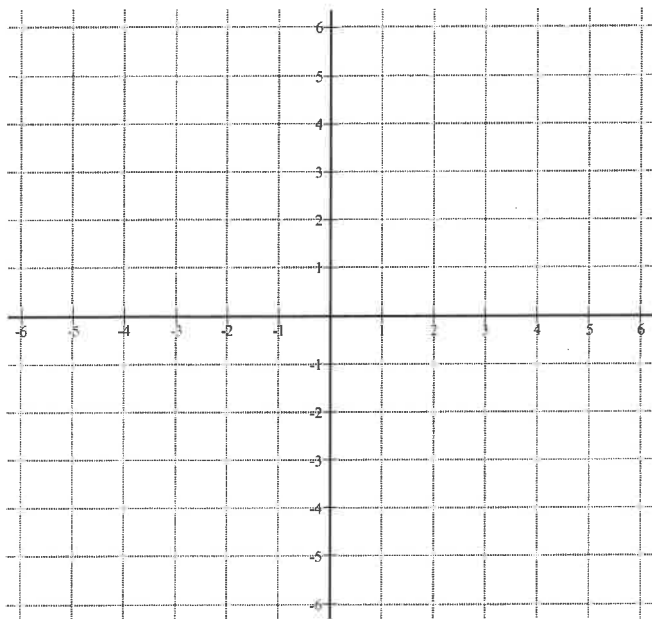
3. Point (3, 2), m =2

Practice Work: w/s (159/160)

5.2 ~~2.1~~ General Form

General Form:

Ex. Rewrite each equation in general form:

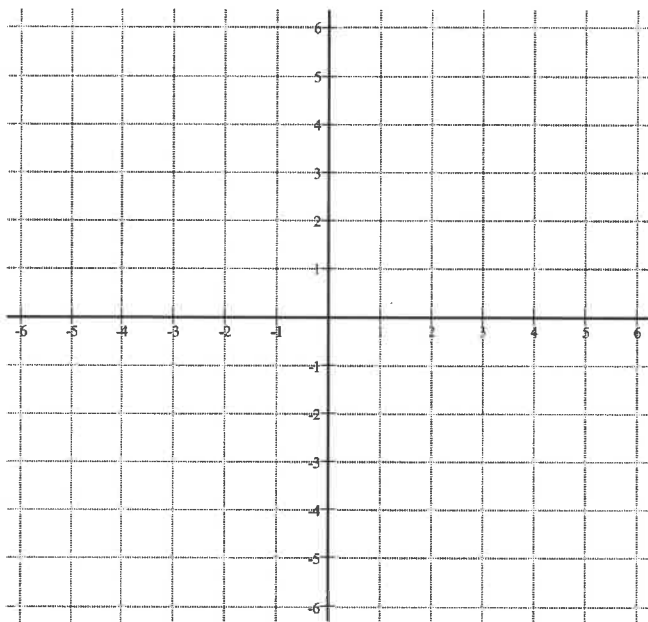$$y = -\frac{2}{3}x + 6$$

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

Ex. For each linear equation determine the x-intercept, determine the y-intercept, and graph the line using the intercepts:

$$2x - 3y - 6 = 0$$

$$4x + 5y - 20 = 0$$

Ex. Sketch each linear relation and identify the intercepts. Then state the domain & range.

$$y - 3 = 0$$

$$x + 4.5 = 0$$

Ex. Spencer has 66 GB of disk space left on his laptop to fill with television shows and movies that he purchases on-line.

a. Suppose a one-hour show uses 1.1 GB of disk space and a movie uses 4.4 GB. Write a linear equation that represents the number of television shows, T, and movies, M, that Spencer can store on his laptop.

b. Determine the T-intercept of a graph of the linear equation. What does the T-intercept represent?

c. What would the M-intercept be? What does the M-intercept represent?

d. If Spencer stores 16 television shows, how many movies does he have space for?

Practice: pg. 365/ # 1 – 8, 10, 11, 14, 15

FMP10   Name: _____

Date: _____

Recall:

Slope-Intercept Form:

General Form:

Slope-Point Form:

Ex. Use slope-point form to write an equation of the line through (-2, 5) with slope -3, then express the equation in slope intercept form.

Ex. Determine the slope and a point on the line: $y - 5 = -2(x + 3)$.

Ex. Use the slope-point form to write an equation of the line through (3, -4) and (5, -1), then rewrite the equation in general form.

Ex. Suppose Brad climbed 660 m to the top of Stawamus Chief moving at a constant rate in 11 pitches (sections). Each pitch was approximately 60 m in height. At 5:45 am Brad started his climb 60 m below the top of his first pitch. By 5:55 am he was 40 m below the top of the first pitch.

    a. Write an equation that describes Brad's distance, d, in metres, below the top of the first pitch in terms of t minutes past 5:45 am. Express the equation in y = mx + b form.

    b. How long did it take Brad to reach the top of the first pitch?

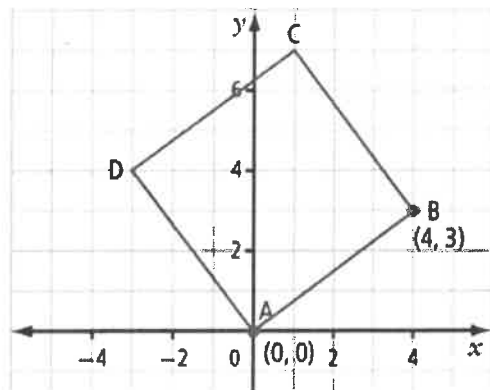   c. In total, Brad spent 8.5 h changing ropes between pitches. How long did it take Brad to climb Stawamus Chief?

Practice: pg. 377/ 2 – 8, 11 – 16, 20

5.4 2̶3̶ Parallel & Perpendicular Lines

ABCD is a square. Calculate the slope of each line segment.

Compare the slopes of pairs of parallel line segments. What do you notice?

Compare the slopes of pairs of perpendicular line segments. What do you notice?

Parallel lines:

Perpendicular lines:

Ex. State whether the lines in each pair are parallel, perpendicular, or neither.

a) $y = 3x - 6$
   $y = -\frac{1}{3}x + 4$

b) $y = 4x + 3$
   $y = 4x - 5$

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

d) $y - 4 = 0$
   $x + 1 = 0$

e) $y = \frac{2}{5}x - 6$
   $5x + 2y = 8$

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

Ex. Write the equation of a line that is parallel to $2x - y + 4 = 0$ and through $(1, -6)$. Express the equation in slope $-$ intercept form and in general form.

Ex. Write the equation of a line perpendicular to $3x + 2y - 6 = 0$ with an x-intercept of 9. Express the equation in slope $-$ intercept form and in general form.

Ex. For the pair of slopes $-\frac{2}{n}$ and $\frac{5}{2}$, what is the value of n if the lines are parallel? What is the value of n if the lines are perpendicular?
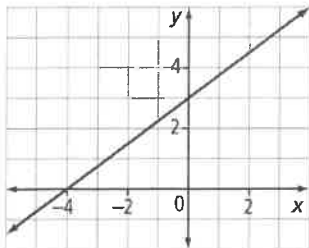
Practice: pg. 390/# 1esl, 2esl, 3 – 5, 6esl, 7esl, 9 – 11, 13 – 16, 19, 20, 22

*esl = every second letter starting with "a"
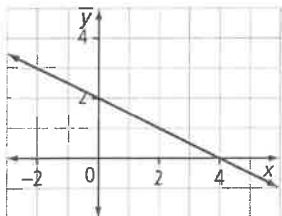
Multiple Choice

For #1 to 5, select the best answer.

1. Which of the statements is true for the graph shown?

A The slope is $-\dfrac{3}{4}$.

B The intercepts are at –4 and 3.

C The x-intercept is at (–4, 0).

D The y-intercept is at (3, 0).

2. Which of the statements is true for the graph shown?

A The domain is $\{x \mid x \geq 4, x \in R\}$.

B The range is $\{y \mid y \leq 4, y \in R\}$.

C The domain and range are both [2, 4].

D The domain and range are both (∞, ∞).

3. To rewrite the equation $-2x + 2y = 5$ in the form $y = mx + b$, a possible approach could be

A subtract $2x$ from both sides and then divide both sides by 2

B add $2x$ to both sides and then divide both sides by 2

C add $-2x$ to both sides and then multiply both sides by 2

D subtract $2x$ from both sides and then multiply both sides by 2

4. Which equation represents a linear relation that has an infinite number of intercepts?

A $y = x$ B $y = 2$

C $y = 0$ D $y = x - 1$

5. Which graph shows a line with a slope of $-\dfrac{2}{5}$ and a y-intercept of 2?

A

B

C

D
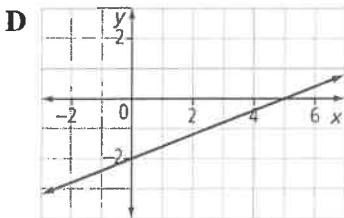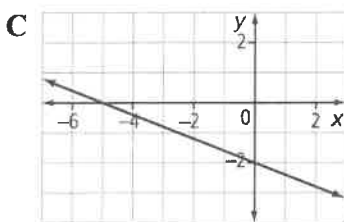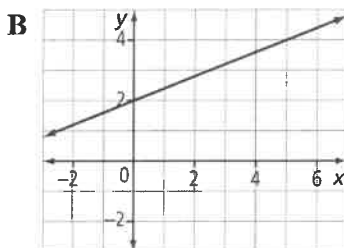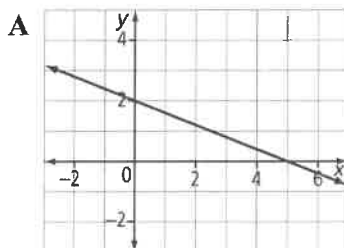
Short Answer

Complete the statements in #6 to #8.

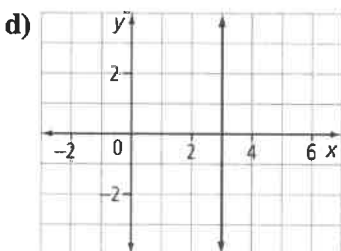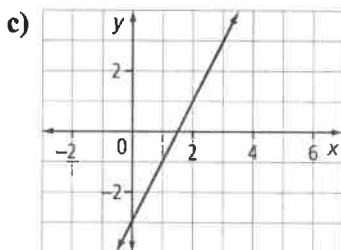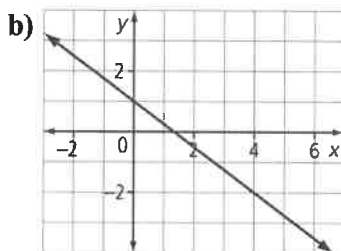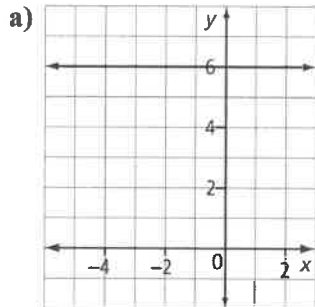6. The x-intercept of the graph of $5x - 3y - 15 = 0$ is $\square$.

7. The slope of the graph of the relation $x = \dfrac{1}{5}y + 2$ is $\square$.

8. The y-intercept of the graph of the line

$y - 3 = \dfrac{1}{2}(x + 10)$ is $\square$.

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

a)

b)

c)

d)

10. Identify the slope of a line parallel to each given line.

a) $y = \dfrac{11}{3}x + 9$

b) $4x + 6y = 20$

11. Identify the slope of a line perpendicular to each given line.

a) $y = 2x - 4$

b) $3x + 5y = 35$

Extended Response

12. A hot-air balloon is rising at a constant rate of 0.75 m/s. The equation that represents the height of the balloon, h, in metres, as a function of time, t, in seconds, is $h = 0.75t + 3$.

a) What does the h-intercept of the graph of the relation represent?

b) State a suitable domain for this situation. Explain what the domain means.

c) How high will the balloon be after 20 s?

d) How long will it take the balloon to reach a height of 15 m?

KEY

1. C 2. D 3. B 4. C 5. A 6. 3 7. 5 8. 8

9. a) $m = 0$, y-intercept: $(0, 6)$ b) $m = -\dfrac{3}{4}$,

y-intercept: $(0, 1)$ c) $m = 2$, y-intercept: $(0, -3)$
d) slope is undefined, no y-intercept

10. a) $\dfrac{11}{3}$ b) $-\dfrac{2}{3}$

11. a) $-\dfrac{1}{2}$ b) $\dfrac{5}{3}$

12. a) It represents the balloon's height of 3 m above ground before it begins rising, at time 0 s.
b) $\{t \mid t \geq 0, t \in R\}$; Example: Since time is positive, this results in a restriction on the height of the balloon.
c) 18 m d) 16 s

CRYPTIC QUIZ

Why did the little girl paint spots on the staircase?

Answer: $\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}$

      14 7 4 3 11 14 11 14 15 4 1 9 2 15 15 4 12

2. What do you call a thirty-six-inch two-by-four?

Answer: $\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}\,\overline{}$

      11 10 6 13 8 4 12 5 11 12 9

Solve each equation for y in terms of x. Find your answer below and notice the letter next to it. Each time the exercise number appears in the code, write this letter above it.

---

① $x + y = 5$

② $-3x + y = -2$

③ $x - y = 7$

④ $-4x - y = 1$

⑤ $3x - y = -10$

⑥ $-x + 2y = 6$

⑦ $x - 2y = 2$

⑧ $-2x + 3y = -12$

⑨ $5x + 2y = 1$

⑩ $4x - 3y = -2$

⑪ $3x + 2y - 6 = 0$

⑫ $x - 4y + 2 = 0$

⑬ $-2x - 6y = 0$

⑭ $8y - 3x = -6$

⑮ $7x = 2y$

Answers:

Ⓔ $y = -4x - 1$

Ⓕ $y = 3x - 1$

Ⓟ $y = -x + 5$

Ⓦ $y = x - 7$

Ⓨ $y = 3x + 10$

Ⓞ $y = 3x - 2$

Answers:

Ⓓ $y = -\frac{5}{2}x + \frac{1}{2}$

Ⓤ $y = \frac{1}{2}x + 3$

Ⓛ $y = \frac{4}{3}x + \frac{2}{3}$

Ⓖ $y = \frac{3}{4}x - 4$

Ⓗ $y = \frac{1}{2}x - 1$

Ⓑ $y = \frac{2}{3}x - 4$

Answers:

Ⓝ $y = \frac{4}{3}x + \frac{1}{4}$

Ⓢ $y = \frac{3}{8}x - \frac{3}{4}$

Ⓡ $y = \frac{1}{4}x + \frac{1}{2}$

Ⓐ $y = -\frac{3}{2}x + 3$

Ⓣ $y = \frac{7}{2}x$

Ⓜ $y = -\frac{1}{3}x$

OBJECTIVE 5-d: To solve an equation for y in terms of x.

Why Didn't The Circus Managers Want Their Human Cannonball To Quit?

Ⓛ $x + y = 2$

Ⓕ $^-2x + y = 5$

Ⓐ $5x + y = ^-1$

Ⓤ $^-3x + y = ^-4$

Ⓣ $x - y = 6$

Ⓔ $^-4x - y = 3$

Ⓢ $2x - y = ^-2$

Ⓨ $x + 2y = 0$

Ⓓ $x + 2y = 5$

Ⓡ $^-3x + 2y = 0$

Ⓥ $^-3x + 2y = 4$

Ⓞ $6x + 3y = 1$

Ⓜ $5x - 2y = 0$

Ⓗ $4x - 2y = 3$

Ⓑ $^-3x - 5y = 10$

Ⓘ $x + 4y = ^-2$

Ⓝ $^-6x - 2y = 5$

Ⓒ $x - 3y = ^-4$

ANSWERS

① $y = \dfrac{^-x}{2}$

② $y = \dfrac{^-3}{5}x - 2$

③ $y = 3x - 4$

④ $y = \dfrac{x}{3} + \dfrac{4}{3}$

⑤ $y = \dfrac{3}{2}x + 2$

⑥ $y = ^-x + 2$

⑦ $y = \dfrac{5}{2}x$

⑧ $y = 2x + 2$

⑨ $y = \dfrac{^-x}{2} + \dfrac{5}{2}$

⑩ $y = ^-5x - 1$

⑪ $y = ^-3x - \dfrac{5}{2}$

⑫ $y = x - 6$

⑬ $y = \dfrac{3}{2}x$

⑭ $y = \dfrac{^-x}{4} - \dfrac{1}{2}$

⑮ $y = 2x + 5$

⑯ $y = ^-2x + \dfrac{1}{3}$

⑰ $y = 2x - \dfrac{3}{2}$

⑱ $y = ^-4x - 3$

CODED ANSWER:

12 – 17 – 18 – 1 – 4 – 16 – 3 – 6 – 9 – 11 – 18 – 5 – 18 – 13 – 15 – 14 – 11 – 9

10 – 11 – 16 – 12 – 17 – 18 – 13 – 7 – 10 – 11 – 16 – 15 – 17 – 14 – 8

4 – 10 – 6 – 14 – 2 – 13 – 18

Why Did Gyro Go Into a Bakery?

For each exercise below, find the equation of the line that has the given slope and passes through the given point. Circle the letter next to the correct equation. Then write this letter in each box at the bottom of the page that contains the number of that exercise.

① $m = 2$; $(3, 2)$	G	$y = 2x + 1$	R	$y = 2x - 4$
② $m = -3$; $(1, 4)$	O	$y = -3x + 7$	P	$y = -3x + 2$
③ $m = -5$; $(-1, 3)$	M	$y = -5x - 2$	D	$y = -5x + 6$
④ $m = 3$; $(-4, -7)$	V	$y = 3x + 1$	E	$y = 3x + 5$
⑤ $m = -1$; $(5, -2)$	U	$y = -x + 3$	C	$y = -x - 1$
⑥ $m = \frac{1}{2}$; $(6, 1)$	W	$y = \frac{1}{2}x - 5$	H	$y = \frac{1}{2}x - 2$
⑦ $m = -\frac{2}{3}$; $(3, 4)$	A	$y = -\frac{2}{3}x - 7$	I	$y = -\frac{2}{3}x + 6$
⑧ $m = \frac{4}{3}$; $(-2, 0)$	K	$y = \frac{4}{3}x + \frac{5}{2}$	F	$y = \frac{4}{3}x + \frac{8}{3}$
⑨ $m = -\frac{1}{4}$; $(2, 1)$	J	$y = -\frac{1}{4}x + \frac{3}{2}$	D	$y = -\frac{1}{4}x - \frac{3}{8}$
⑩ $m = 4$; $\left(-1, \frac{1}{2}\right)$	A	$y = 4x - \frac{2}{3}$	T	$y = 4x + \frac{9}{2}$
⑪ $m = -2$; $(0, 0)$	L	$y = -2x$	B	$y = -2x - 2$
⑫ $m = 0$; $\left(-5, \frac{3}{4}\right)$	S	$y = \frac{3}{4}$	N	$y = -5x$

9	5	12	10	8	2	1	10	6	4	12	3	4	11	11	2	8	7	10

OBJECTIVE 5–n: To find an equation of a line given the slope and one point on the line.

What Happened When Two Fruit Companies Merged?

For each exercise below, find the equation of the line passing through the given points. Circle the two letters next to the correct equation. Then write these letters in the two boxes at the bottom of the page that contain the number of that exercise.

Answers:

① (1, 5) (2, 7)

② (0, 1) (3, −8)

③ (2, −3) (4, −2)

④ (2, 5) (4, 2)

⑤ (−3, −5) (−1, 3)

IS $y = \frac{2}{3}x + 3$ TH $y = \frac{1}{2}x - 4$

AP $y = -\frac{3}{2}x + 8$ UI $y = -3x + 5$

ST $y = \frac{1}{2}x - 7$ DE $y = 2x + 3$

CT $y = -3x + 1$ EY $y = 4x + 7$

LO $y = -\frac{3}{2}x - 4$ IL $y = 2x + 1$

Answers:

⑥ (3, −1) (−6, −4)

⑦ (4, 1) (−4, 7)

⑧ (−1, 2) (3, 4)

⑨ (−1, −4) (2, 0)

⑩ (3, −1) (−3, 5)

HA $y = \frac{1}{2}x - 1$ ER $y = -\frac{3}{4}x + 4$

IS $y = \frac{1}{3}x + \frac{8}{3}$ EL $y = -2x - 1$

PE $y = -x + 2$ EA $y = -\frac{3}{4}x + 2$

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

MA $y = \frac{1}{2}x + \frac{5}{2}$ FE $y = \frac{4}{3}x - \frac{8}{3}$

3	3	5	5	8	8	1	1	4	4	7	7	9	9	2	2	10	10	6	6

OBJECTIVE 5–o: To find an equation of a line given two points on that line (not using the graph).

General

Find the equation of the line in ~~standard~~ form:

1.   m=-3, (4,5)

                                5.   (5,2)   (2,-1)

2. $m=\dfrac{2}{3}$, (-1, 1)

                                6.   (-3, 6)   (-3, 2)

3.   m=-2, (-2,-7)

                                7.   (-4, 2)   y-intercept of 2

4. $m=\dfrac{3}{4}$, x-intercept of 1

                                8.   X- intercept of -6,   y-intercept of 3

PMA 10   Writing Equations in Standard Form

Find the equation of the line in standard form:

1. m=-3, (4,5)

$3x + y - 17 = 0$

2. m=$\frac{2}{3}$, (-1, 1)

$2x - 3y + 5 = 0$

3. m=-2, (-2,-7)

$2x + y + 11 = 0$

4. m =$\frac{3}{4}$, x-intercept of 1

$3x - 4y - 3 = 0$

5. (5,2) (2,-1)

$x - y - 3 = 0$

6. (-3, 6) (-3, 2)

$x + 3 = 0$

7. (-4, 2) y-intercept of 2

$y - 2 = 0$

8. X- intercept of -6, y-intercept of 3

$x - 2y + 6 = 0$

$/30$

1. What are the slope and y-intercept of each line? (2 marks each)

   a) $y = 5x - 3$ **b)** $y = -x$ **c)** $y = \frac{x}{3} + 4$ **d)** $y = -2$

2. Express each equation in slope-intercept form. (2 marks each)

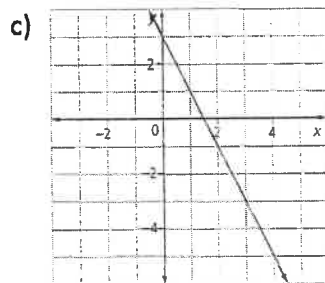   **a)** $4x + 5y - 20 = 0$ **b)** $2x - 3y = 6$

3. Sketch the graph of each line using the slope and y-intercept. (2 marks each)

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

4. Write the equation of each line in the slope-intercept form. (2 marks each)

a)

b)

c)

d)
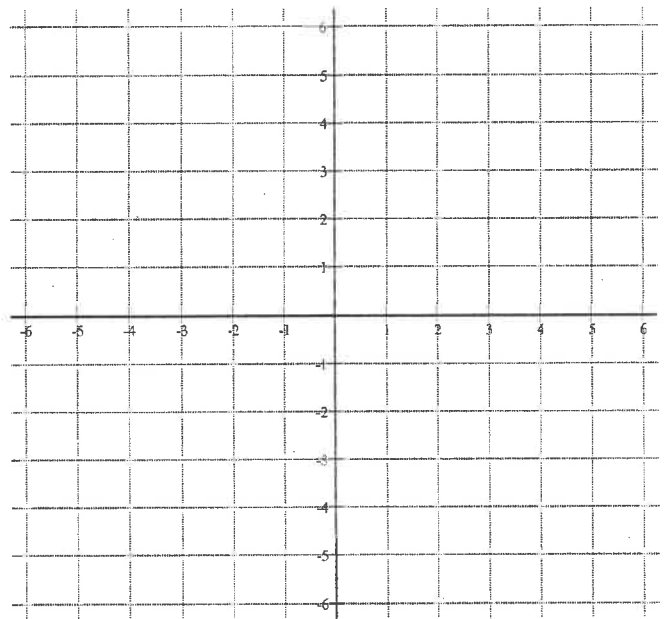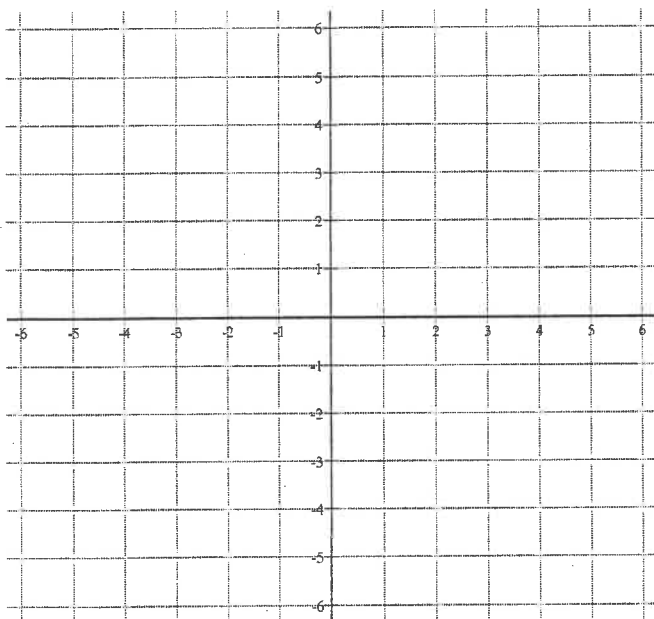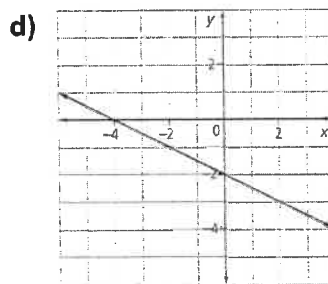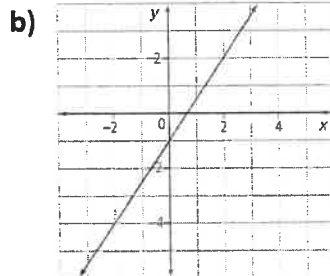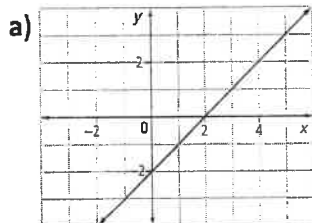
5. Write the equation of each line in the slope-intercept form. (2 marks each)

a) The slope is 2. The line passes through the point (1, 4).

b) The y-intercept is −3. The line passes through the point (−2, 6).

c) The line passes through the points (0, 4) and (2, 6).

Assignment Unit 7 #2

Name_____

$/26$

1. Rewrite each linear equation into general form? (2 marks each)

   a) $y = 5x - 3$

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

2. Write the equation with given information in slope-point form. (2 marks each)
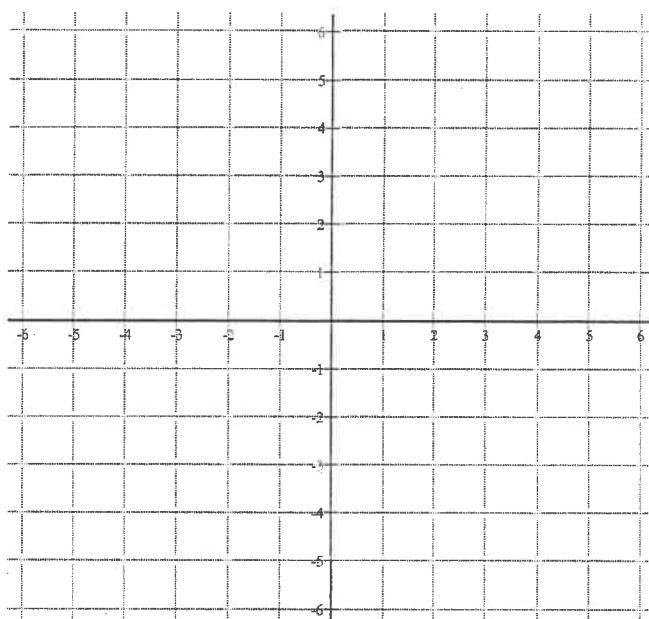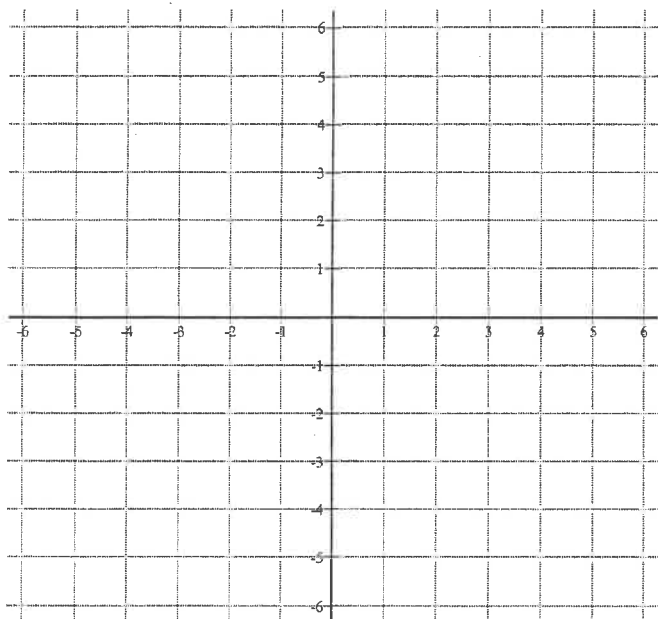
   a) $m = -2$; point $(3, 5)$

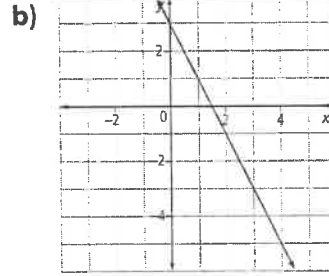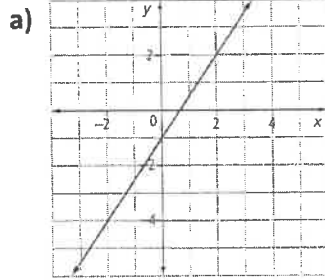   **b)** $m = \frac{3}{5}$; point $(1, -2)$

3. Sketch the graph of each line. (1 mark each)

   a) $y + 3 = 0$

   b) $x - 2 = 0$

4. Write the equation of each line in the slope-point form. Then convert to general form.
(3 marks each)

a)

b)

5. Determine, algebraically, the x-intercept and y-intercept of each line. (2 marks each)

a) $3x - 4y = 12$

b) $2x + 5y + 9 = 0$

6. Write an equation, in general form, for each line described. (1 mark each)

a) a vertical line passing through the point $(-1, 5)$

b) a horizontal line passing through the point $(-4, 2)$

7. What is the equation of each line in slope-point form? (2 marks each)

a) same x-intercept as the line $y = 3x - 4$ and through $(0, 5)$

b) x-intercept of -5 and y-intercept of 4