

Chapter 6 – Analyse Linear Relations – Exam Review

MPM1D

Jensen

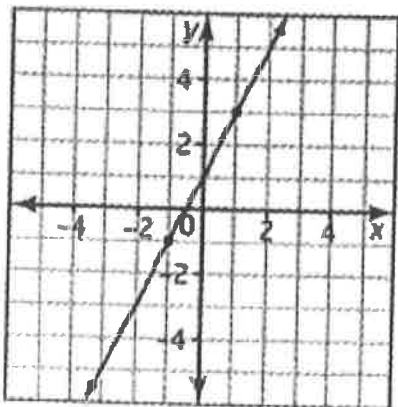
Section 1: The Equation of a Line in Slope y-intercept Form: $y = mx + b$

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

	Equation	Slope	y-intercept
a)	$y = 3x - 2$	3	-2
b)	$y = \frac{3}{4}x - 5$	$\frac{3}{4}$	-5
c)	$y = -\frac{2}{5}x$	$-\frac{2}{5}$	0
d)	$y = 5$	0	5

2. Find the slope, y-intercept, and equation of each line in slope y-intercept form. (6 marks)

a)

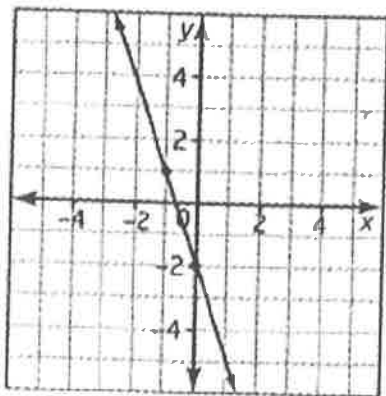


Slope $m = 2$

y-intercept $b = 1$

Equation: $y = 2x + 1$

b)

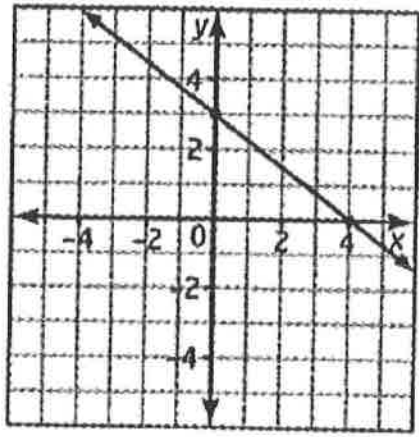


Slope $m = -3$

y-intercept $b = -2$

Equation: $y = -3x - 2$

c)



Slope $m = \frac{-3}{4}$

y-intercept $b = 3$

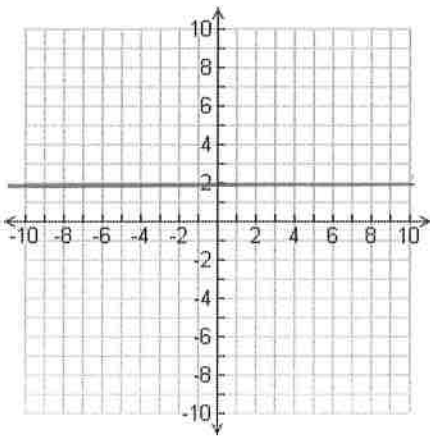
Equation: $y = \frac{-3}{4}x + 3$

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

a) $y = 2$

slope: \emptyset

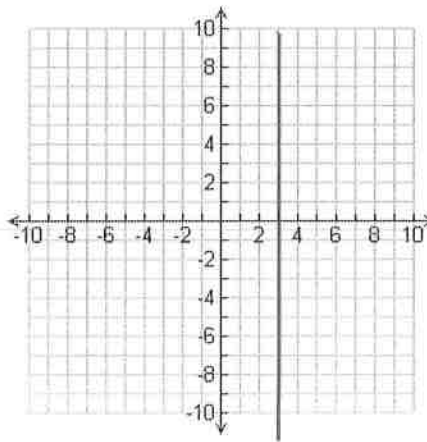
y-intercept: 2



b) $x = 3$

slope: undefined

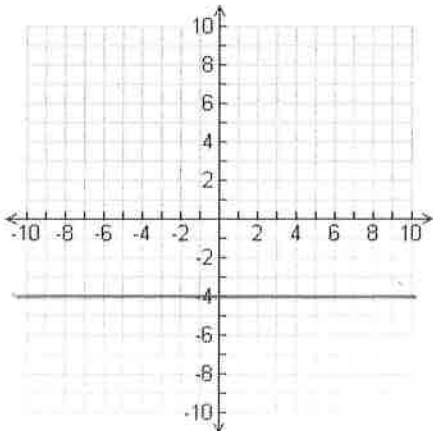
y-intercept: none



a) $y = -4$

slope: \emptyset

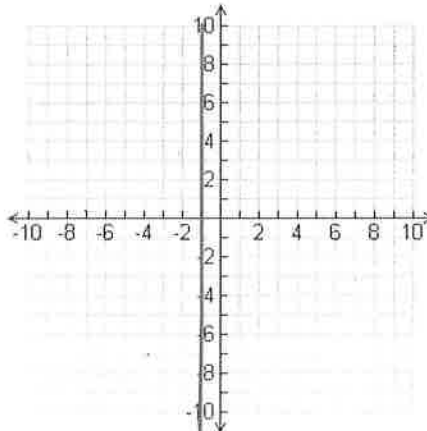
y-intercept: -4



b) $x = -1$

slope: undefined

y-intercept: none



Section 2: 6.2 The Equation of a Line in Standard Form

4. Express each equation in the form $y = mx + b$. Then state the slope and y-intercept.

a) $x + y - 4 = 0$

$$y = -x + 4$$

b) $x - y + 2 = 0$

$$-y = -x - 2$$

$$y = x + 2$$

c) $x + 4y + 3 = 0$

$$4y = -x - 3$$

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

Slope: -1

y-intercept: 4

Slope: 1

y-intercept: 2

Slope: $-\frac{1}{4}$

y-intercept: $-\frac{3}{4}$

d) $x - 3y - 8 = 0$

$$-3y = -x + 8$$

$$y = \frac{1}{3}x - \frac{8}{3}$$

e) $2x + 5y + 10 = 0$

$$5y = -2x - 10$$

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

f) $3x - 2y + 6 = 0$

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

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

Slope: $\frac{1}{3}$

y-intercept: $-\frac{8}{3}$

Slope: $-\frac{2}{5}$

y-intercept: -2

Slope: $\frac{3}{2}$

y-intercept: 3

5. The Gala Restaurant uses the equation $30n - C + 200 = 0$ to determine the cost for a room rental, where C represents the cost, in dollars, which depends on n , the number of people attending.

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

$$-C = -30n - 200$$

$$C = 30n + 200$$

Identify the fixed (y-intercept) and variable costs (slope).

$$b = 200$$

$$m = 30$$

c) What is the rental cost if 100 people attend a hockey banquet?

$$\begin{aligned} C &= 30n + 200 \\ &= 30(100) + 200 \\ &= 3200 \end{aligned}$$

\$3200

6. The Home Medical Supplies Rental Company charges according to the equation $60m - C + 75 = 0$ to rent hospital beds, where C represents the cost, in dollars, which depends on m , the number of months that the bed is rented for.

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

$$C = 60m + 75$$

b) Identify the slope and y-intercept.

$$m = 60 \quad b = 75$$

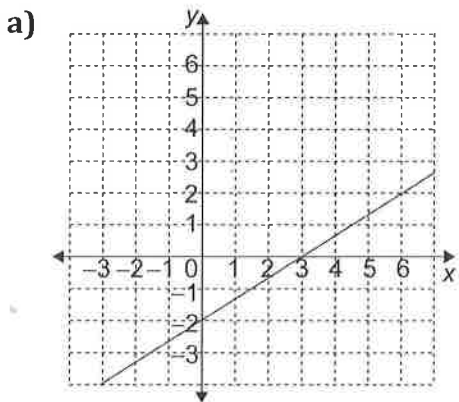
c) What is the rental cost if a hospital bed is rented for 5 months?

$$\begin{aligned} C &= 60(5) + 75 \\ &= 375 \end{aligned}$$

\$375

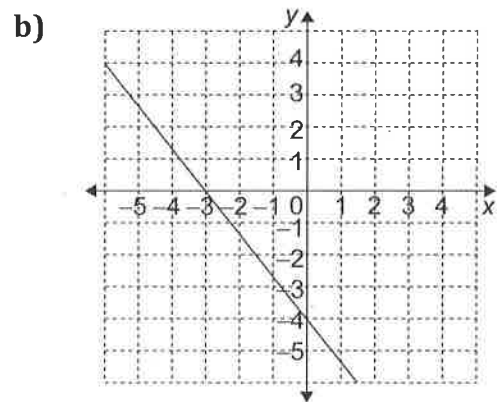
Section 3: Graph using x- and y-intercepts

7. Identify the x- and y-intercepts of each line



x-int
(3, 0)

y-int
(0, -2)



x-int
(-3, 0)

y-int
(0, -4)

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

a) $3x + 4y = 12$

x-int

$$3x + 4(0) = 12$$

$$3x = 12$$

$$x = 4$$

$$(4, 0)$$

y-int

$$3(0) + 4y = 12$$

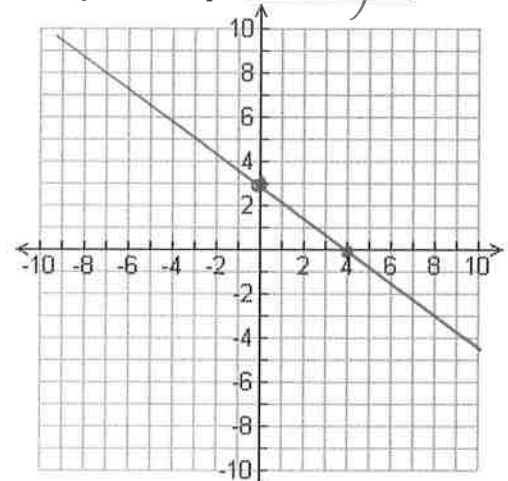
$$4y = 12$$

$$y = 3$$

$$(0, 3)$$

x-intercept: (4, 0)

y-intercept: (0, 3)



b) $2x + y = 8$

x-int

$$2x + 0 = 8$$

$$2x = 8$$

$$x = 4$$

$$(4, 0)$$

y-int

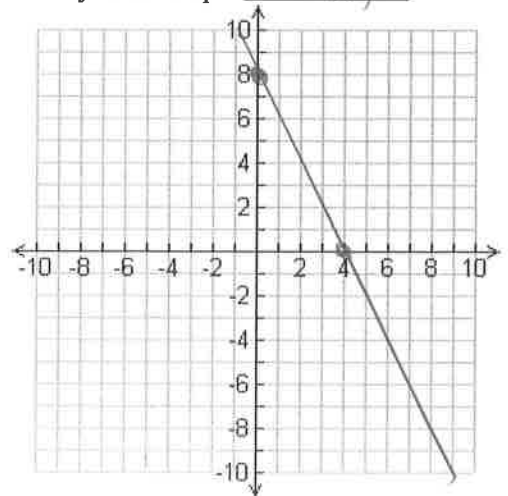
$$2(0) + y = 8$$

$$y = 8$$

$$(0, 8)$$

x-intercept: (4, 0)

y-intercept: (0, 8)



c) $x - 3y = 6$

x-int

$$x - 3(0) = 6$$

$$x = 6$$

$$(6, 0)$$

y-int

$$0 - 3y = 6$$

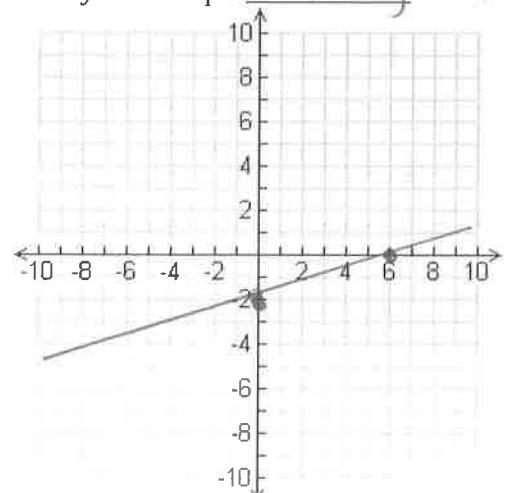
$$-3y = 6$$

$$y = -2$$

$$(0, -2)$$

x-intercept: (6, 0)

y-intercept: (0, -2)



d) $-2x + 3y = 6$

x-int

$-2x + 3(0) = 6$

$-2x = 6$

$x = -3$

$(-3, 0)$

y-int

$-2(0) + 3y = 6$

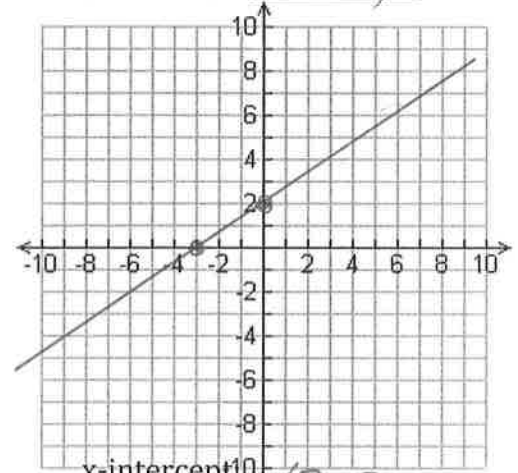
$3y = 6$

$y = 2$

$(0, 2)$

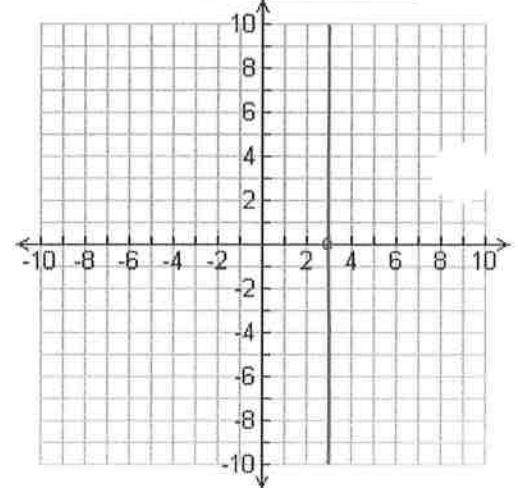
x-intercept: $(-3, 0)$

y-intercept: $(0, 2)$



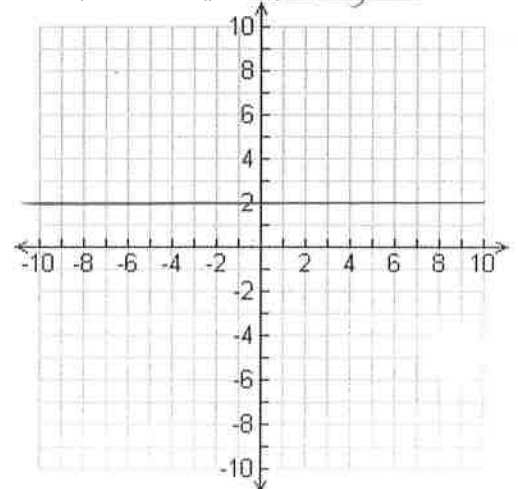
x-intercept: $(-3, 0)$

y-intercept: none



x-intercept: none

y-intercept: $(0, 2)$



e) $3x = 9$

$x = 3$

f) $4y = 8$

$y = 2$

Section 4: Parallel and Perpendicular Lines

9. Find the slope of each pair of lines and state whether they are parallel, perpendicular or neither.

a) $y = 2x + 3$ and $y = 2x - 1$

parallel

b) $y = 4x + 2$ and $y = \frac{-1}{4}x + 1$

perpendicular

c) $y = 3x + 1$ and $y = \frac{1}{3}x + 1$

neither

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

parallel

e) $y = x + 1$ and $y = -x + 1$

perpendicular

f) $y = 3x - 2$ and $y = 2x - 3$

neither

g) $y = 3$ and $y = -2$

parallel

h) $y = 1$ and $x = -1$

perpendicular

i) $x + y = 3$ and $x + y = 2$

parallel

j) $3x + 2y - 6 = 0$ and $2x - 3y + 6 = 0$

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

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

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

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

perpendicular

k) $2x + y - 1 = 0$ and $\frac{1}{2}x + y - 2 = 0$

$$y = -2x + 1$$

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

neither

l) $x + y - 2 = 0$ and $x - y - 2 = 0$

$$y = -x + 2$$

$$y = x - 2$$

perpendicular

10. For each line, state the slope of a line that is parallel and a line that is perpendicular.

a) $y = 3x + 5$

Parallel Slope:
Perpendicular Slope:

b) $y = -2x + 3$

Parallel Slope:
Perpendicular Slope:

c) $y = \frac{2}{3}x + 4$

Parallel Slope:
Perpendicular Slope:

d) $y = -\frac{2}{5}x - 7$

Parallel Slope:
Perpendicular Slope:

e) $2x + 3y = 12$

Parallel Slope:
Perpendicular Slope:

f) $5x - 3y - 15 = 0$

Parallel Slope:
Perpendicular Slope:

g) $y = 3$

Parallel Slope:
Perpendicular Slope:

h) $x = 5$

Parallel Slope:
Perpendicular Slope:

i) $y = 7$

Parallel Slope:
Perpendicular Slope:

11. Determine whether or not the points A(1,3), B(5,1), and C(6,3) form a right angle triangle. Justify your answer with mathematical reasoning.

Section 5: Find an Equation for a Line Given the Slope and a Point

12. Find the equation of a line with the given slope and passing through the given point.

a) $m = 2, P(4,5)$

$$y = mx + b$$

$$5 = 2(4) + b$$

$$5 = 8 + b$$

$$-3 = b$$

$$y = 2x - 3$$

b) $m = -4, P(-3, -2)$

$$-2 = -4(-3) + b$$

$$-2 = 12 + b$$

$$-14 = b$$

$$y = -4x - 14$$

c) $m = \frac{3}{5}, P(5, -1)$

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

$$-1 = 3 + b$$

$$-4 = b$$

$$y = \frac{3}{5}x - 4$$

d) $m = -\frac{1}{4}, P(2,6)$

$$6 = \left(-\frac{1}{4}\right)(2) + b$$

$$\frac{12}{2} = -\frac{1}{2} + b$$

$$\frac{12}{2} + \frac{1}{2} = b$$

$$b = \frac{13}{2}$$

$$y = -\frac{1}{4}x + \frac{13}{2}$$

e) $m = 0, P(5, -4)$

$$y = -4$$

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

$$\frac{1}{4} = 3\left(\frac{2}{3}\right) + b$$

$$\frac{1}{4} = 2 + b$$

$$\frac{1}{4} - \frac{8}{4} = b$$

$$-\frac{7}{4} = b$$

$$y = 3x - \frac{7}{4}$$

g) $m = \frac{2}{3}, P(0,0)$

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

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

$$-4 = \frac{1}{2}(-3) + b$$

$$-4 = -\frac{3}{2} + b$$

$$-\frac{8}{2} + \frac{3}{2} = b$$

$$-\frac{5}{2} = b$$

$$y = \frac{1}{2}x - \frac{5}{2}$$

i) $m = 5, P(2,3)$

$$3 = (5)(2) + b$$

$$3 = 10 + b$$

$$-7 = b$$

$$y = 5x - 7$$

13. Find the equation of a line...

a) parallel to $y = 2x + 5$, passing through $(3,2)$

$$2 = 2(3) + b$$

$$2 = 6 + b$$

$$-4 = b$$

$$y = 2x - 4$$

b) perpendicular to $y = 3x - 4$ passing through $(6, -3)$

$$-3 = \left(-\frac{1}{3}\right)(6) + b$$

$$-3 = -2 + b$$

$$-1 = b$$

$$y = -\frac{1}{3}x - 1$$

c) parallel to $y = 4$, passing through $(2, 3)$

$$y = 3$$

d) parallel to $y = \frac{1}{2}x + 3$, passing through the origin

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

e) perpendicular to $y = -\frac{5}{2}x + 3$, passing through $(5, -3)$

$$-3 = \left(\frac{2}{5}\right)(5) + b$$

$$-3 = 2 + b$$

$$-5 = b$$

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

f) with an x-intercept of 5 and a y-intercept of 15.

$$(5, 0)$$

$$(0, 15)$$

$$m = \frac{15}{-5}$$

$$= -3$$

$$y = mx + b$$

$$y = -3x + 15$$

14. Find an equation for the line perpendicular to $2x + 5y - 3 = 0$, with the same y-intercept as $2x + 3y + 6 = 0$.

slope
 $2x + 5y - 3 = 0$

$$5y = -2x + 3$$

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

$$\perp m = \frac{5}{2}$$

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

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

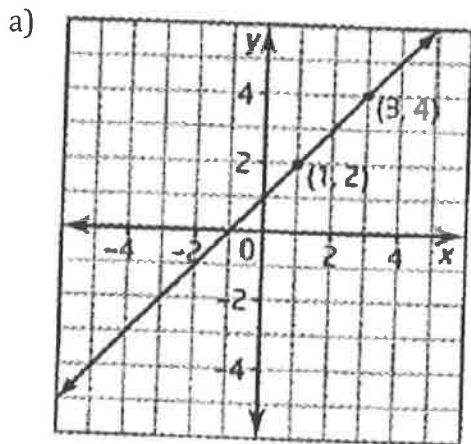
$$y = -\frac{2}{3}x - 2$$

$$b = -2$$

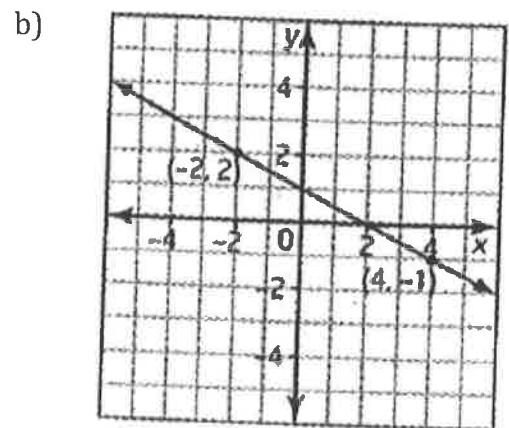
$$y = \frac{5}{2}x - 2$$

Section 6: Find an Equation for a Line Given Two Points

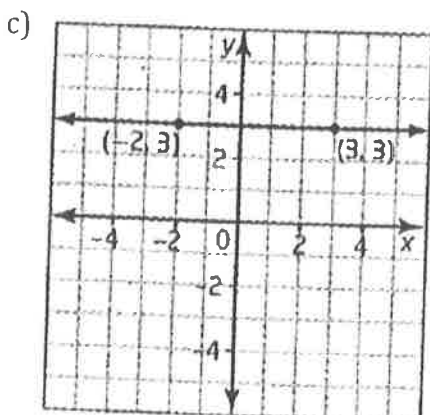
15. Find the equation of each line



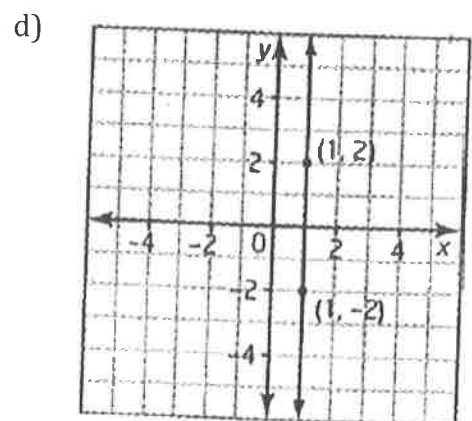
$$y = x + 1$$



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



$$y = 3$$



$$x = 1$$

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

a) A(3,4) and B(6,10)

$$m = \frac{10-4}{6-3}$$
$$= \frac{6}{3}$$
$$= 2$$
$$y = mx + b$$
$$4 = (2)(3) + b$$
$$4 = 6 + b$$
$$-2 = b$$

$$y = 2x - 2$$

b) D(1,5) and E(3,-3)

$$m = \frac{-3-5}{3-1}$$
$$= \frac{-8}{2}$$
$$= -4$$
$$y = mx + b$$
$$5 = (-4)(1) + b$$
$$5 = -4 + b$$
$$9 = b$$

$$y = -4x + 9$$

c) M(-3,6) and N(1,-4)

$$m = \frac{-4-6}{1-(-3)}$$
$$= \frac{-10}{4}$$
$$= -\frac{5}{2}$$
$$y = mx + b$$
$$-4 = \left(-\frac{5}{2}\right)(1) + b$$
$$-4 = -\frac{5}{2} + b$$
$$-\frac{8}{2} + \frac{5}{2} = b$$
$$-\frac{3}{2} = b$$

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

d) P~~(1,7)~~^(1,7) and Q(2,-3)

$$m = \frac{-3-7}{2-1}$$
$$= \frac{-10}{1}$$
$$= -10$$
$$y = mx + b$$
$$7 = (-10)(1) + b$$
$$7 = -10 + b$$
$$17 = b$$

$$y = -10x + 17$$

e) x-intercept of -2 and y-intercept of 5

$$(-2, 0) \quad (0, 5)$$

$$m = \frac{5-0}{0-(-2)}$$
$$= \frac{5}{2}$$

$$y = \frac{5}{2}x + 5$$

f) x-intercept of 4 and y-intercept of -2

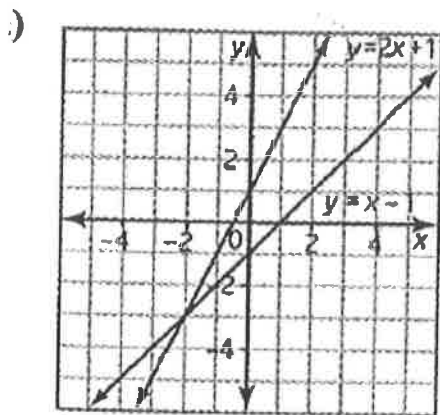
$$(4, 0) \quad (0, -2)$$

$$m = \frac{-2-0}{0-4}$$
$$= \frac{-2}{-4}$$
$$= \frac{1}{2}$$

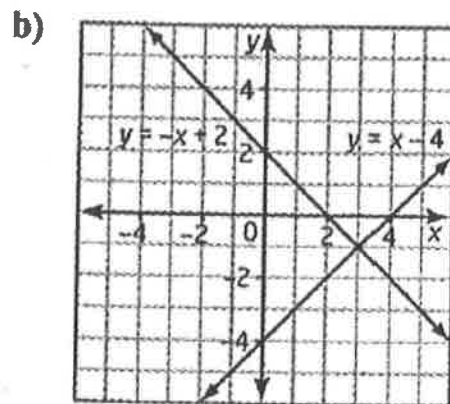
$$y = \frac{1}{2}x - 2$$

Section 7: Linear Systems

17. Give the coordinates of the point of intersection of each linear system.



$(-2, -3)$

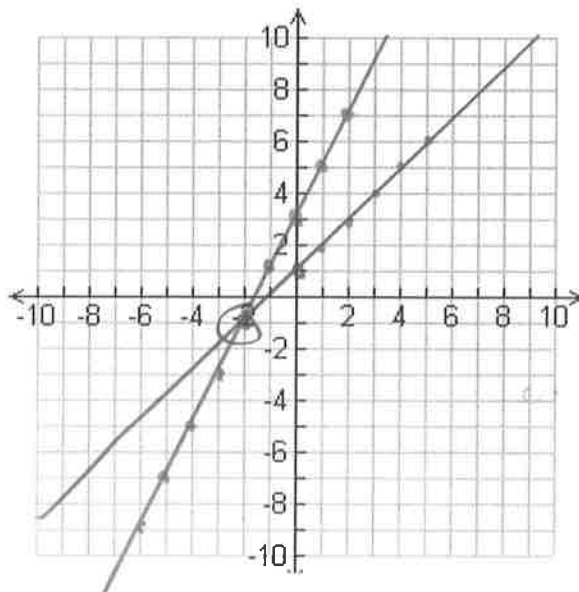


$(3, -1)$

18. Solve each linear system by graphing each line and finding the point of intersection.

a) $y = x + 1$ and $y = 2x + 3$

$(-2, -1)$



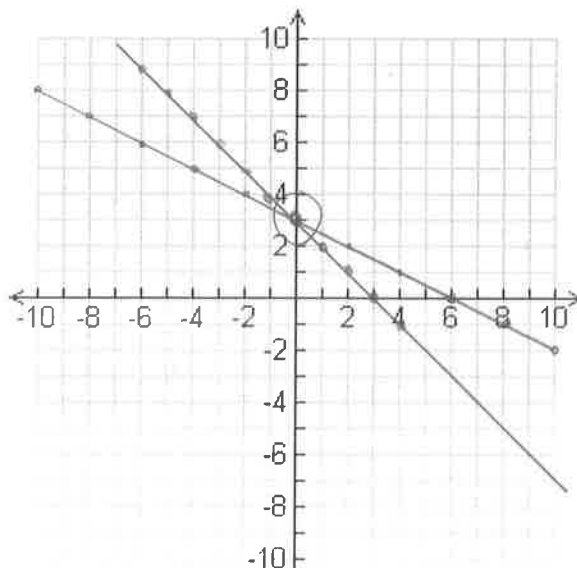
b) $x + y = 3$ and $x + 2y = 6$

$y = -x + 3$

$2y = -x + 6$

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

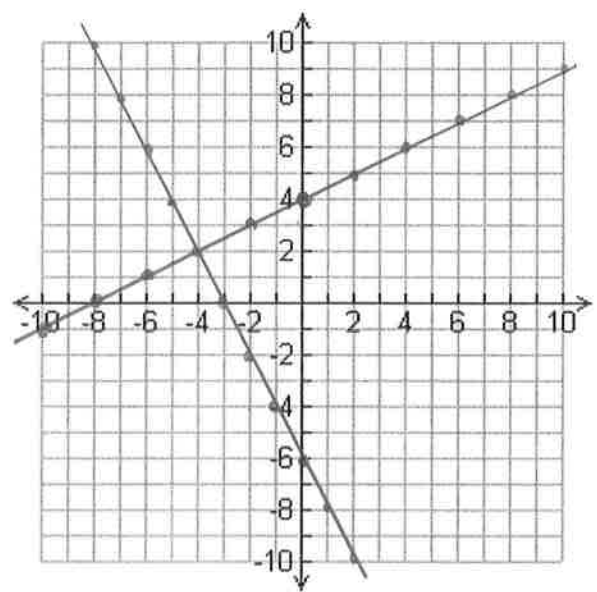
$(0, 3)$



c) ~~2x + y + 6 = 0~~ and $2x + y + 6 = 0$

$y = \frac{1}{2}x + 4$ $y = -2x - 6$

$(-4, 2)$



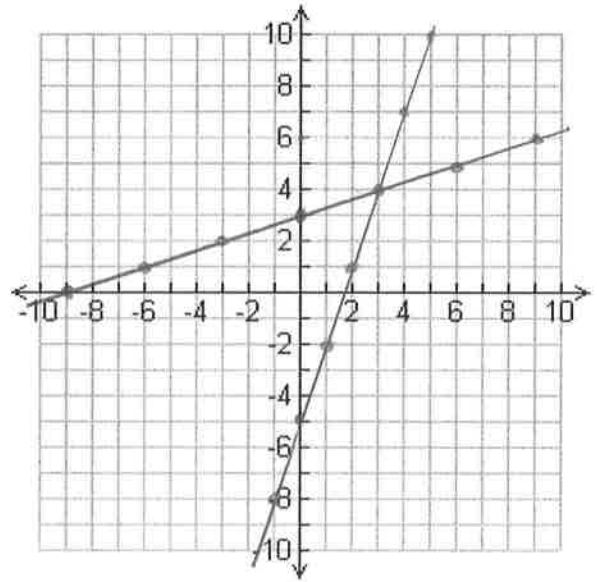
d) $y = 3x - 5$ and ~~2x + y + 6 = 0~~

$3y - x = 9$

$3y = x + 9$

$y = \frac{1}{3}x + 3$

$(3, 4)$



e) $3x - y = 4$ and ~~2x + y + 6 = 0~~

$y = 3x - 4$

$y = x - 6$

$(-1, -7)$

