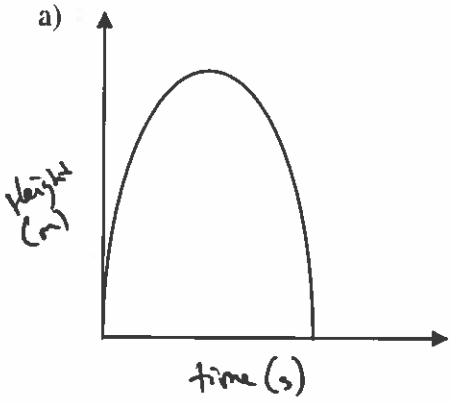
Chapter 6 – Linear Relations and Functions

6.1 Graphs of Relations

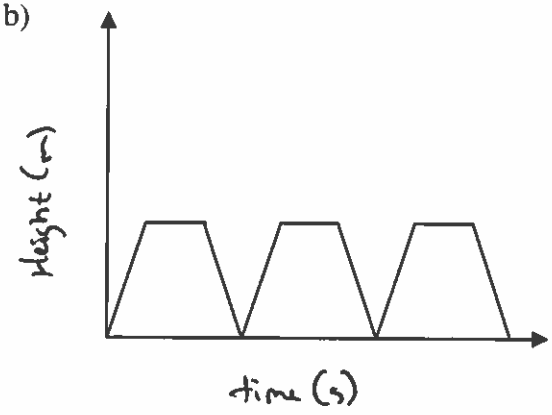
52. Describe a practical situation that could be represented by each graph:

a)



Height of a football thrown by the Canucks as they try to slope a home run.

b)

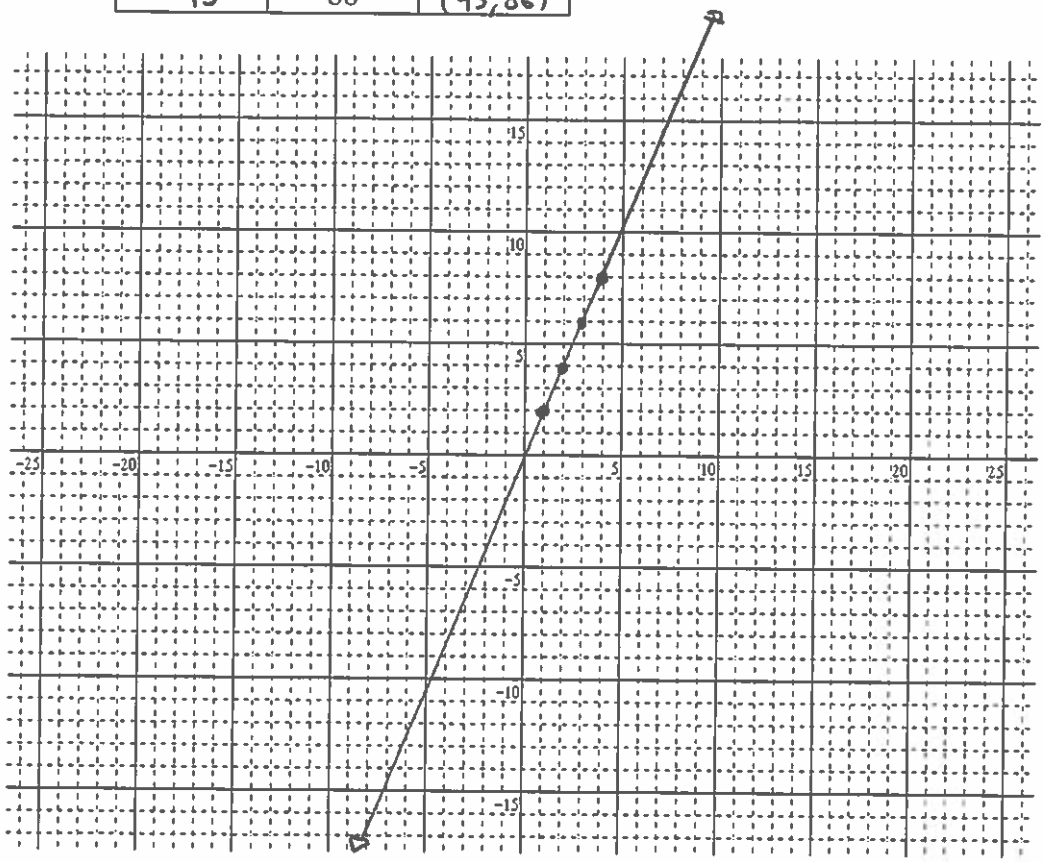


Height of hammer above a nail that is being hit 3 times.

6.2 Linear Relations

53. The following table represents a series of points that can be plotted on the Cartesian Plane. Fill in the spaces on the table and plot the points on a graph

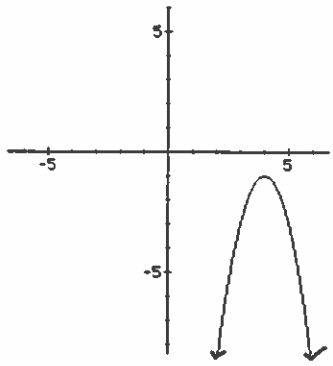
x	y	ordered pair
1	2	(1,2)
2	4	(2,4)
3	6	(3,6)
4	8	(4,8)
17	34	(17,34)
43	86	(43,86)



6.3 Domain and Range

54. Give the domain and range of each graph. Use words, a number line, interval notation, and set notation.

a)



Domain: All values of x.

$(-\infty, \infty)$

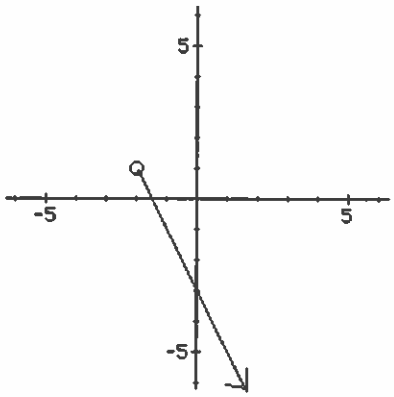
$\{x \mid -\infty < x < \infty, x \in \mathbb{R}\}$ or $\{x \in \mathbb{R}\}$

Range: All values of y less than or equal to -1.

$(-\infty, -1]$

$\{y \mid -\infty < y \leq -1, y \in \mathbb{R}\}$ or $\{y \mid y \leq -1, y \in \mathbb{R}\}$

b)



Domain: All values of x greater than -2.

$(-2, \infty)$

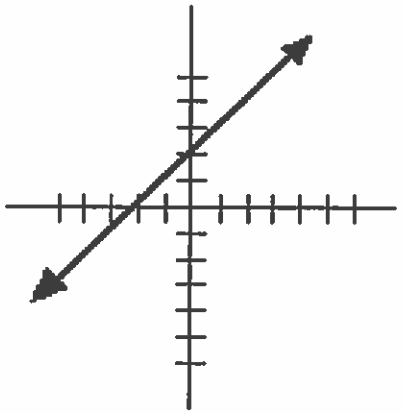
$\{x \mid -2 < x < \infty, x \in \mathbb{R}\}$ or $\{x \mid x > -2, x \in \mathbb{R}\}$

Range: All values of y less than 1.

$(-\infty, 1)$

$\{y \mid -\infty < y < 1, y \in \mathbb{R}\}$ or $\{y \mid y < 1, y \in \mathbb{R}\}$

c)



Domain: All values of x.

$(-\infty, \infty)$

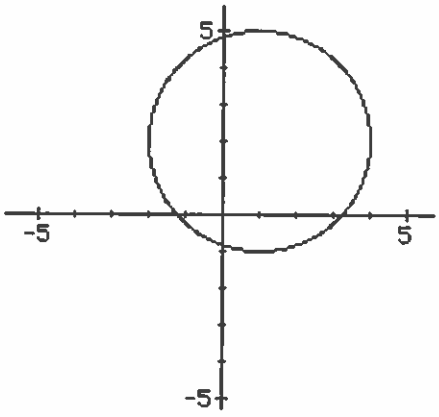
$\{x \mid -\infty < x < \infty, x \in \mathbb{R}\}$ or $\{x \in \mathbb{R}\}$

Range: All values of y.

$(-\infty, \infty)$

$\{y \mid -\infty < y < \infty, y \in \mathbb{R}\}$ or $\{y \in \mathbb{R}\}$

d)



Domain: Values of x between and including -2 and 4.

$[-2, 4]$

$\{x \mid -2 \leq x \leq 4, x \in \mathbb{R}\}$

Range: Values of y between and including -1 and 5.

$[-1, 5]$

$\{y \mid -1 \leq y \leq 5, y \in \mathbb{R}\}$

6.4 Functions

55. Determine whether or not each relation is a function.

a) (2,5), (4,3), (6,1), (8,-1), (9,-2)

Function. Each value of x has only one possible y-value.

b) (3,2), (5,6), (6,8), (3,-2), (6,-4)

Not a function. When $x = 3$, $y = 2$ and -2.
Fails vertical line test.

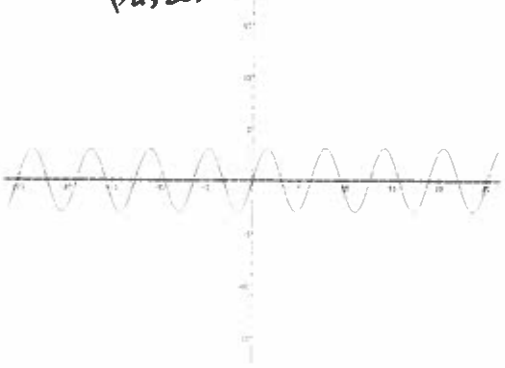
c) (8,1), (7,1), (-3,1), (-4,1)

Function. Each value of x has only one possible y-value.

56. Determine whether or not each relation is a function.

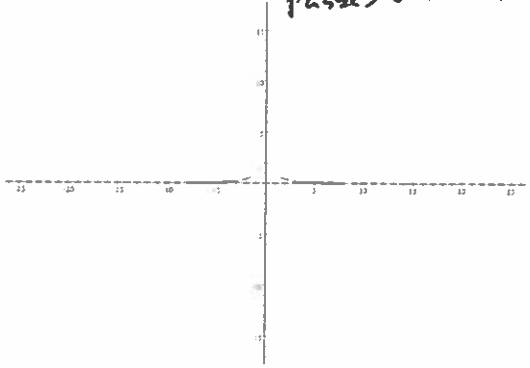
a)

Function.
Passes vertical-line test.



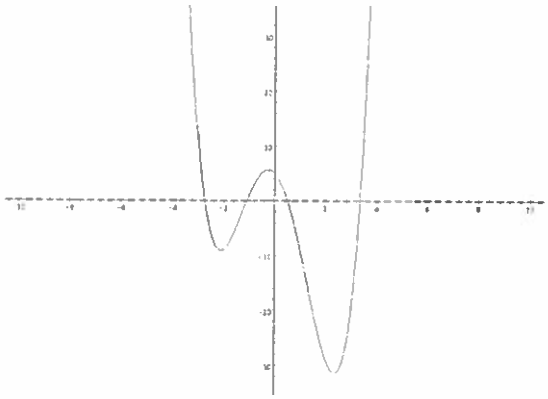
b)

Function.
Passes vertical line test.



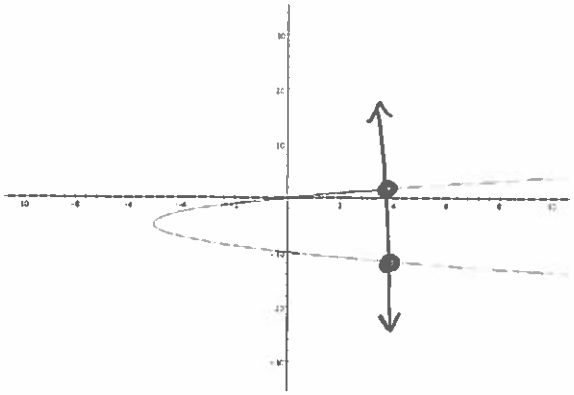
Function. Passes vertical line test.

c)



Not a function. Fails vertical line test

d)



57. If $f(x) = 4x - 5$, find:

a) $f(5)$

$f(5) = 4(5) - 5$

$= 20 - 5$

$= 15$

b) $f(-1)$

$f(-1) = 4(-1) - 5$

$= -4 - 5$

$= -9$

c) $f(0)$

$f(0) = 4(0) - 5$

$= 0 - 5$

$= -5$

d) $f(1000)$

$f(1000) = 4(1000) - 5$

$= 4000 - 5$

$= 3995$

6.5 Slope

58. Determine the slope of the line which passes through the following points:

a) (6, 8) and (10, 5)
$x_1\ y_1 \quad x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-8}{10-6} = \frac{-3}{4}$

b) (0, 0) and (3, 5)
$x_1\ y_1 \quad x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-0}{3-0} = \frac{5}{3}$

c) (3, 5) and (-2, -1)
$x_1\ y_1 \quad x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-5}{-2-3} = \frac{-6}{-5} = \frac{6}{5}$

d) (-2, -4) and (-3, -5)
$x_1\ y_1 \quad x_2\ y_2$

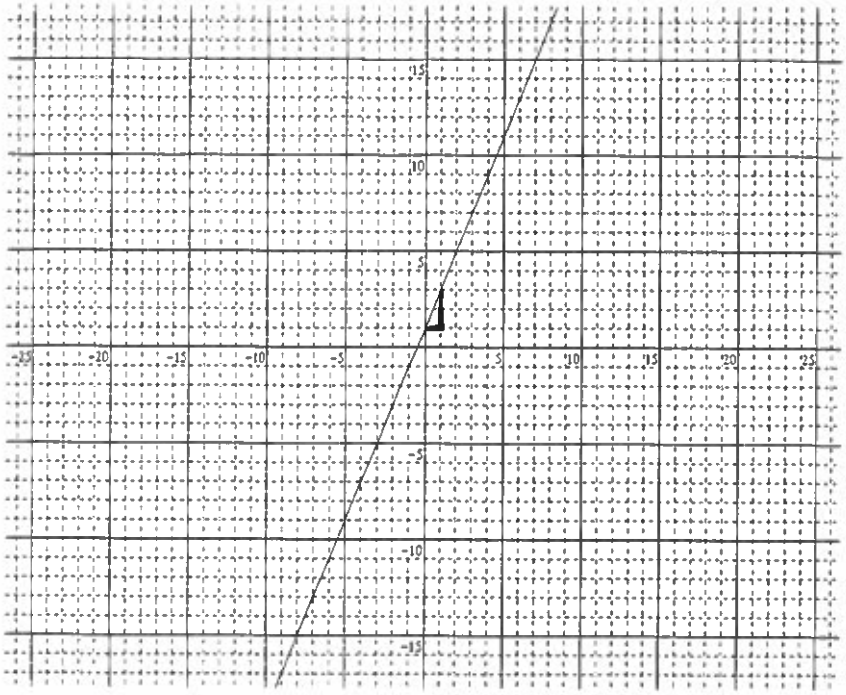
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5-(-4)}{-3-(-2)} = \frac{-5+4}{-3+2} = \frac{-1}{-1} = 1$

e) (3.7, 5.1) and (-1.5, 1.2)
$x_1\ y_1 \quad x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1.2 - 5.1}{-1.5 - 3.7} = \frac{-3.9}{-5.2} = 0.75$

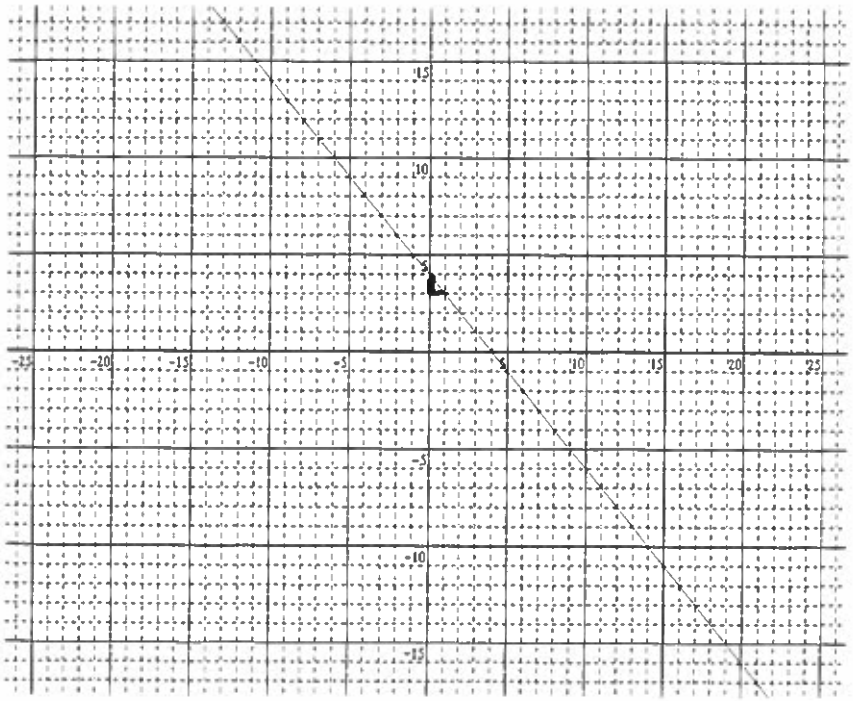
59. Determine the slope of each line.

a)



$m = \frac{rise}{run} = \frac{2}{1} = 2$

b)



$m = \frac{rise}{run} = \frac{-1}{1} = -1$

Chapter 7 – Linear Equations and Graphs

7.1 Slope-Intercept Form

60. Find the slope and the y-intercept of each line.

a) $y = 2x - 5$

$m = 2$

$b = -5$

b) $y = 0.5x - 2.25$

$m = 0.5$

$b = -2.25$

c) $y = -7$ $\quad y = 0x - 7$

$m = 0$

$b = -7$

61. Express each of the following in slope and y-intercept form.

a) $x + y = 5$

$-x \quad -x$

$y = -x + 5$

b) $x + y - 7 = 0$

$-x \quad -x$

$y - 7 = -x$

$+7 \quad +7$

$y = -x + 7$

c) $4x + 2y = 3$

$-4x \quad -4x$

$2y = -4x + 3$

$\div 2 \quad \div 2 \quad \div 2$

$y = -2x + 1.5$

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

$-3x \quad -3x$

$2y+6=-3x$

$-6 \quad -6$

$2y=-3x-6$

$2y=-3x-6$

$\div 2 \quad \div 2 \quad \div 2$

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

e) $x-3y-9=0$

$-x \quad -x$

$-3y-9=-x$

$+9 \quad +9$

$-3y=-x+9$

$\div(-3) \quad \div(-3) \quad \div(-3)$

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

62. Write the equation of each line in the form $y=mx+b$

a) slope = 2; y-intercept = 3 $y=2x+3$

b) slope = 3; y-intercept = -2 $y=3x-2$

c) slope = $\frac{1}{2}$; y-intercept = 1 $y=\frac{1}{2}x+1$

d) slope = $-\frac{2}{3}$; y-intercept = -2 $y=-\frac{2}{3}x-2$

63. Consider the equation $y=4x+b$. What is each value of b if a graph of the line passes through each point?

a) (4, 11)

$x \quad y$

$11=4(4)+b$

$11=16+b$

$-16 \quad -16$

$-5=b$

b) (-2, -9)

$x \quad y$

$-9=4(-2)+b$

$-9=-8+b$

$+8 \quad +8$

$-1=b$

7.2 General Form

64. Express each of the following in general form, $Ax+By+C=0$.

a) $y=8x-3$

$-y \quad -y$

$0=8x-y-3$

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

$-y \quad -y$

$0=-\frac{5}{2}x-y+\frac{7}{2}$

$\cdot(-2) \cdot(-2) \cdot(-2) \cdot(-2)$

$0=5x+2y-7$

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

$-y \quad -y$

$0=\frac{1}{3}x-y+\frac{1}{2}$

$\cdot 6 \quad \cdot 6 \quad \cdot 6 \quad \cdot 6$

$0=2x-6y+3$

65. Determine the x- and y-intercepts of each line.

a) $x-y-5=0$

x-int (Set $y=0$)

$x-(0)-5=0$

$x-5=0$

$x=5$

y-int (Set $x=0$)

$(0)-1y-5=0$

$-1y-5=0$

$-5=y$

b) $4x-3y-24=0$

x-int (Set $y=0$)

$4x-24=0$

$4x=24$

$x=6$

y-int (Set $x=0$)

$-3y-24=0$

$-24=3y$

$-8=y$

c) $2x+5y-6=0$

x-int (Set $y=0$)

$2x-6=0$

$2x=6$

$x=3$

y-int (Set $x=0$)

$5y-6=0$

$5y=6$

$y=6/5$

7.3 Slope-Point Form

66. Write an equation of the line that passes through the given point and has the given slope. Express the equation in point-slope form.

a) $(4,0)$ and $m=-0.5$

$(y-y_1)=m(x-x_1)$

$(y-0)=-0.5(x-4)$ or $y=-0.5(x-4)$

b) $(5,2)$ and $m=3$

$(y-y_1)=m(x-x_1)$

$(y-2)=3(x-5)$

67. Write an equation in point-slope form of the line through $(-2,5)$ and $(-6,7)$.

$x_1\ y_1$ $x_2\ y_2$

$m=\frac{y_2-y_1}{x_2-x_1}=\frac{7-5}{-6-(-2)}=\frac{2}{-4}=-\frac{1}{2}$

$(y-y_1)=m(x-x_1)$ → $(y-5)=-\frac{1}{2}(x+2)$

→ $(y-7)=-\frac{1}{2}(x+6)$

7.4 Parallel and Perpendicular Lines

68. Given the slopes of the two lines, determine whether the lines are parallel, perpendicular, or neither.

a) $m_1 = 2$; $m_2 = -\frac{3}{6}$

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

Perpendicular

b) $m_1 = -\frac{2}{3}$; $m_2 = -\frac{2.4}{3.6}$

$m = -0.\overline{6}$ $m = -0.\overline{6}$

$m = -\frac{2}{3}$ $m = -\frac{2}{3}$

Parallel

c) $m_1 = 5$; $m_2 = -5$

Neither

d) $m_1 = \frac{2}{3}$; $m_2 = -1.5$

$m = \frac{2}{3}$ $m = -\frac{3}{2}$

Perpendicular

Chapter 8 – Solving Systems of Linear Equations Graphically

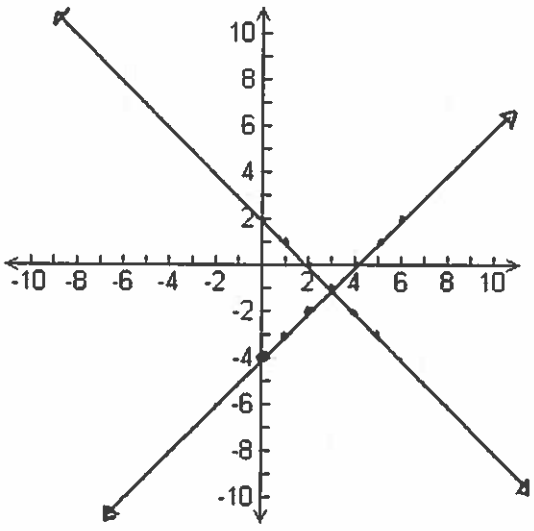
8.1 Systems of Linear Equations and Graphs

69. Solve each system of equations graphically and verify your solutions.

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

$y = x - 4$
$y = -1x + 2$

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

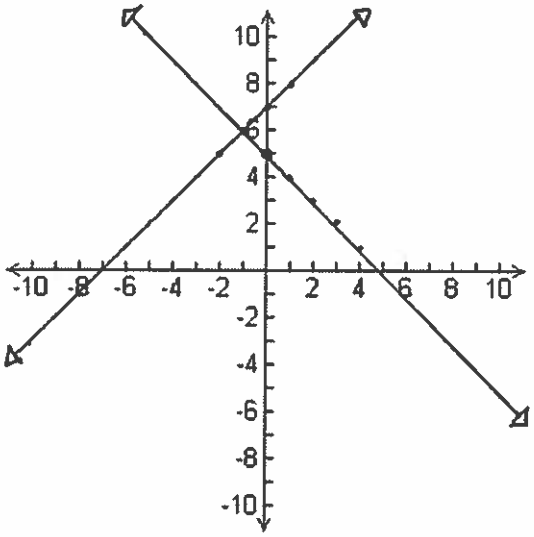


Soln is (3, -1)

b) $x + y = 5$
$x - y = -7$

$y = -x + 5$
$y = x + 7$

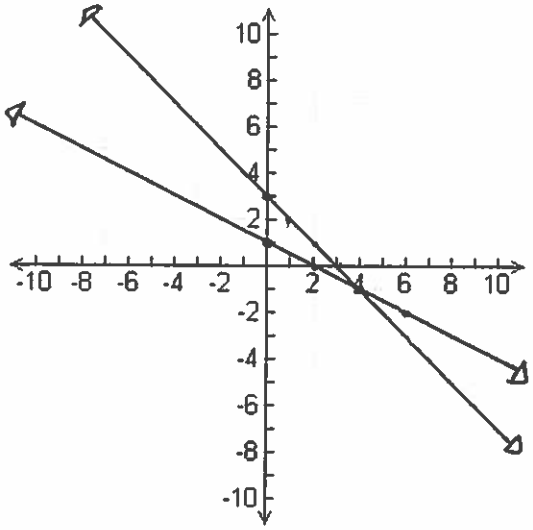
$y = -\frac{1}{1}x + 5$
$y = \frac{1}{1}x + 7$



Soln is (-1, 6)

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

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



Soln is $(4,-1)$

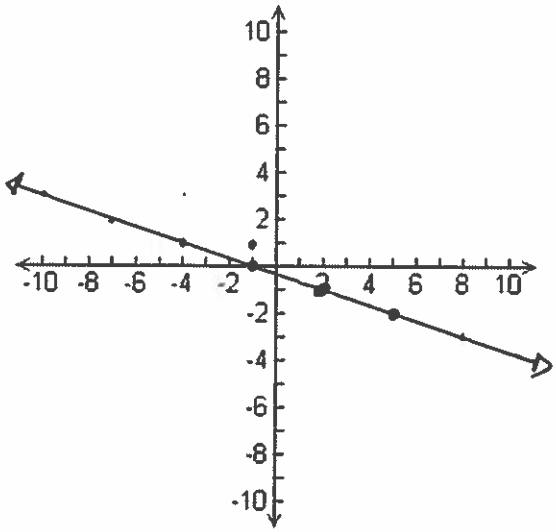
d) $x+3y=-1$
$2x+6y+2=0$

$3y = -x-1$
$6y = -2x-2$
$y = -\frac{1}{3}x-\frac{1}{3}$
$y = -\frac{1}{3}x-\frac{1}{3}$

Same equation!

Intersects... everywhere?

O_o



Chapter 9 – Solving Systems of Linear Equations Algebraically

9.1 Solving Systems of Linear Equations by Substitution

70. Solve each of the following by using the substitution method:

a) $y = 12$
$2x - y = 8$

$2x - (12) = 8$
$2x - 12 = 8$
$+12 \quad +12$
$2x = 20$
$\boxed{x = 10}$ Soln is $(10, 12)$

b) $-x + y = 2 \rightarrow y = x + 2$
$x + y = 4$

$x + (x+2) = 4$
$2x + 2 = 4$
$-2 \quad -2$
$2x = 2$
$\boxed{x = 1}$ $y = (1) + 2$
$\boxed{y = 3}$
Soln is $(1, 3)$

c) $-4x + y = 3 \rightarrow y = 4x + 3$
$2x + 3y = -5$

$2x + 3(4x+3) = -5$
$2x + 12x + 9 = -5$
$-9 \quad -9$
$14x = -14$
$\boxed{x = -1}$ $y = 4(-1) + 3$
$\boxed{y = -1}$
Soln is $(-1, -1)$

d) $x + y = 3 \rightarrow y = -x + 3$
$3x + 4y = 8$

$3x + 4(-x+3) = 8$
$3x - 4x + 12 = 8$
$-12 \quad -12$
$-1x = -4$
$\boxed{x = 4}$ $y = -(4) + 3$
$\boxed{y = -1}$
Soln is $(4, -1)$

e) $x+y=-5$ → $y = -x-5$

$-4x+2y=2$ → $-4x+2(-x-5)=2$

$-4x-2x-10=2$

$+10 \quad +10$

$-6x=12$

$\boxed{x=-2}$

$y=-(-2)-5$

$=2-5$

$\boxed{y=-3}$

Soln is $(-2,-3)$

71. The sum of two numbers is 752 and their difference is 174. Use substitution to determine the two numbers

$x+y=752$

$y-x=174$ → $y=x+174$

$x+(x+174)=752$

$2x+174=752$

$-174 \quad -174$

$2x=578$

$\div 2 \quad \div 2$

$\boxed{x=289}$

$y=(289)+174$

$\boxed{y=463}$

9.2 Solving Systems of Linear Equations by Elimination

72. Solve each of the following by using the elimination method:

a) $x+3y=7$

$-(x+2y=5)$

$1y=2$

$\boxed{y=2}$

$x+3(2)=7$

$x+6=7$

$\boxed{x=1}$

Soln is $(1,2)$

b) $2x-y=-5$

$+(5x+y=-2)$

$7x=-7$

$\boxed{x=-1}$

$2(-1)-y=-5$

$-2-y=-5$

$+2 \quad +2$

$-1y=-3$

$\boxed{y=3}$

Soln is $(-1,3)$

c) $4x+2y=6$
$-(4x-3y=1)$

$5y=5$

$\boxed{y=1}$

$4x+2(1)=6$
$4x+2=6$
$-2 \quad -2$
$4x=4$
$\boxed{x=1}$

Soln is $(1,1)$

d) $2(2x+y=7)$ → $4x+2y=14$
$4x-3y=9$ → $-(4x-3y=9)$

$5y=5$

$\boxed{y=1}$

$2x+(1)=7$
$2x+1=7$
$-1 \quad -1$
$2x=6$
$\boxed{x=3}$

Soln is $(3,1)$

e) $3(x+3y=2)$ → $3x+9y=6$
$3x-2y=-6$ → $-(3x-2y=-6)$

$11y=12$

$\boxed{y=\frac{12}{11}}$

73. At the cafeteria, three hamburgers and three Cokes cost $9.00. Two hamburgers and one Coke cost $4.75. Use the elimination method to determine the cost of one hamburger and the cost of one Coke.

Let x = hamburger
Let y = Coke

$3x+3y=9$
$3(2x+1y=4.75)$ → $-(6x+3y=14.25)$

$-3x = -5.25$

$\boxed{x=1.75}$

$2(1.75)+1y=4.75$
$3.5+y=4.75$
$\boxed{y=1.25}$

Hamburger = $1.75
Coke = $1.25