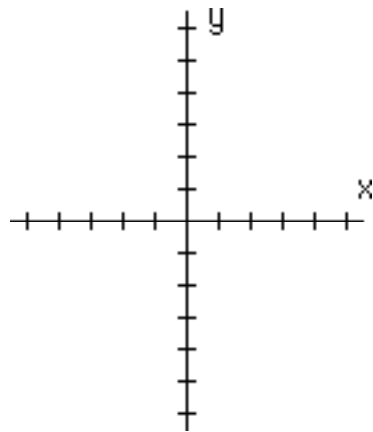
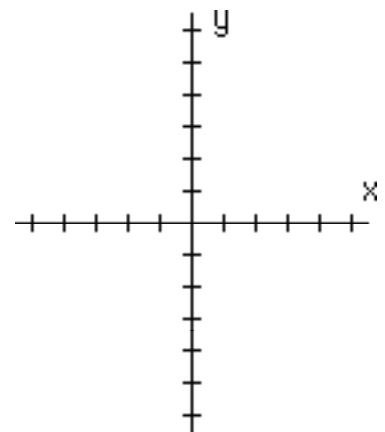


Chapter 5: Linear Equations and Inequalities

5.1 Rectangular Coordinate System



Graph the ordered pairs $(-1,3)$, $(1,4)$, $(-4,0)$, and $(-2,-1)$.



Find the coordinates of each of the points

Find the coordinates of each of the points

Scatter Diagrams

In March of 1998, the American Council for an Energy-Efficient Economy released its ranking of environmentally friendly and unfriendly cars and trucks sold in the United States. The following table shows the fuel use, in miles per gallon of gasoline, both in the city and on the highway, for six of the vehicles ranked worst for the environment. Graph the scatter diagram for these data.

City fuel use, x	12	9	10	12	13	12
Highway use, y	16	15	13	16	17	17

5.2 Graphs of Straight Lines

A solution of a linear equation in two variables is an ordered pair of numbers (x,y) that makes the equation a true statement.

$$y = mx + b$$

For $y = 3x - 5$, find the value of m and the value of b . Is $(-1,-8)$ a solution?

Is $(2, -4)$ a solution of $y = -\frac{1}{2}x - 3$?

Find the ordered pair solution of

$$y = -\frac{1}{4}x + 1 \text{ that corresponds to } x = 4.$$

A graph of an equation in two variables is a drawing of the ordered pair solutions of the equation.

- find three solutions to the equation
- graph the points
- draw a line through the points

Graph $y = 2x + 2$

Graph $y = -3x + 1$

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

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

Graph $y = 3x$

Graph equations of the form

$$Ax + By = C$$

by first rewriting to the form

$$y = mx + b$$

then

- find three solutions to the equation
- graph the points
- draw a line through the points

Write $5x - 2y = 10$ in the form $y = mx + b$
then graph the equation.

Graph $x - 3y = 9$

x-intercept is where the graph crosses the x-axis, $(x,0)$.

y-intercept is where the graph crosses the y-axis, $(0,y)$.

Find the x- and y-intercepts for $4x - y = 4$. Graph the line.

Graph of $y = b$

Graph of $x = a$

Graph $y = 3$

Graph $x = -4$

5.3 Slopes of Straight Lines

The slope of a line is the ratio of the change in the y-coordinates between any two points on the line to the change in x-coordinates.

$$\text{Slope} = m =$$

Find the slope of the line containing points $(-1,1)$ and $(2,3)$.

Find the slope of the line containing points $(-3,4)$ and $(2,-2)$.

Find the slope of the line containing points $(-1,3)$ and $(2,3)$.

Find the slope of the line containing points $(2,4)$ and $(2,-2)$.

Find the slope of the line containing points $(-1,2)$ and $(1,3)$.

Find the slope of the line containing points $(1,2)$ and $(4,-5)$.

Find the slope of the line containing points $(2,3)$ and $(2,7)$.

Find the slope of the line containing points $(1,-3)$ and $(-5,-3)$.

For any equation of the form

$$y = mx + b,$$

the slope of the line is m , the y -intercept is b .

Graph $y = 2x + 3$

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

Graph $x - 2y = 4$

5.4 Equations of Straight Lines

Slope intercept form: $y = mx + b$

Find the equation of the line that has slope 2 and y-intercept (0,3).

Find the equation of the line that has slope $\frac{3}{2}$ and contains the point (4,-2).

Point-Slope Formula

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

Use the point slope formula to find the equation of a line that passed through the point whose coordinates are $(-2, -1)$ and has slope $\frac{3}{2}$.

Use the point slope formula to find the equation of a line that passed through the point whose coordinates are $(5,4)$ and has slope $\frac{2}{5}$.

5.5 Functions

Set = a collection of objects

Eg.

Relation = set of ordered pairs

Eg.

Domain of a relation = set of first coordinates of the ordered pairs.

Eg.

Range of a relation = set of second coordinates of the ordered pairs.

Eg.

Function = a relation where no two ordered pairs have the same first coordinate and different second coordinates.

Eg.

Find the domain and range of the relation $\{(-5, 1), (-3, 3), (-1, 5)\}$. Is the relation a function?

Find the domain and range of the relation $\{(1,0), (1,1), (1,2), (1,4), (1,4)\}$. Is the relation a function?

$f(x)$ is the **value of the function** at x

$$f(x) = x^2$$

$$f(\quad) = (\quad)^2$$

Evaluate $f(x) = 2x - 4$ at $x = 3$. Write an ordered pair that is an element of the function.

Evaluate $f(x) = -5x + 1$ at $x = 2$. Write an ordered pair that is an element of the function.

When a function is described by an equation and the domain is specified, the range of the function can be found.

Find the range of the function given by the equation $f(x) = -3x + 2$ if the domain is $\{-4, -2, 0, 2, 4\}$

Find the range of the function given by the equation $f(x) = 4x - 3$ if the domain is $\{-5, -3, -1, 1\}$

Graphs of linear functions

Equations of the form $y = mx + b$ are functions.

y = dependent variable

x = independent variable

Can write $y = 2x + 1$ in functional notation.

Functions of the form $f(x) = mx + b$ are called linear functions.

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

The value, V , of an investment of \$2500 at an annual simple interest rate of 6% is given by the equation $V = 150t + 2500$, where t is the amount of time, in years, that the money is invested. Write the equation in functional notation. Graph the equation for values of t between 0 and 10. The point whose coordinates are $(5, 3250)$ is on the graph. Write a sentence that explains the meaning of this ordered pair.

A car is traveling at a uniform speed of 40 mph. The distance, d (in miles), the car travels in t hours is given by the equation $d = 40t$. Write the equation in functional notation. Graph the equation for values of t between 0 and 5. The point whose coordinates are $(3, 120)$ is on the graph. Write a sentence that explains the meaning of this ordered pair.

5.6 Graphing Linear Inequalities.

The graph of $y = x + 1$ separates a plane into three sets:

$$y = x + 1$$

$$y > x + 1$$

$$y < x + 1$$

- Solve for y
- Graph the line
- Decide which half-plane
- Solid line or dashed line

Graph the solution set of $2x + 3y \leq 6$.

Graph the solution set of $3x + y > -2$.

Graph the solution set of $y > 3$.

Graph the solution set of $x < 3$.