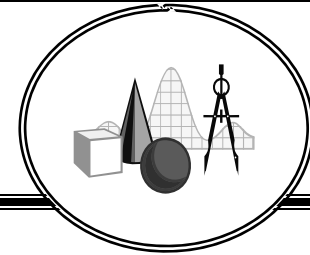


## abscissa



**Definition and illustration (if applicable):**

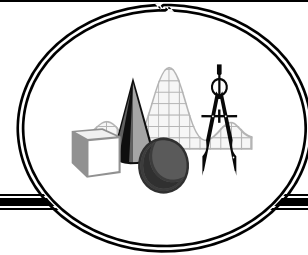
**the x-value of an ordered pair that describes the vertical distance from the x-axis.**

**It is always written as the first element in the ordered pair.**

**3 is the abscissa of the ordered pair (3, 5).**

**Associated terms:**

## absolute value

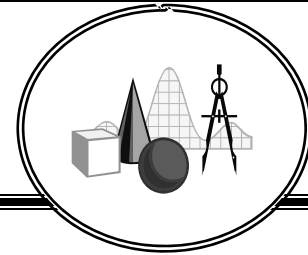


### Definition and illustration (if applicable):

The absolute value of a real number,  $x$ , is the distance from  $x$  to the origin on the real number line. Because absolute value represents distance, absolute value is never less than zero.

### Associated terms:

# algorithm



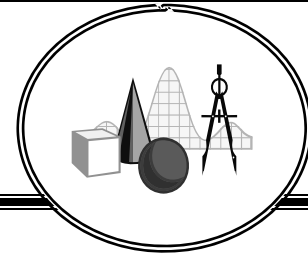
**Definition and illustration (if applicable):**

**a sequence of steps that produce a desired outcome**  
**In mathematics, an algorithm is often a step-by-step procedure.**

**Associated terms:**

Algebra Vocabulary

**argument**

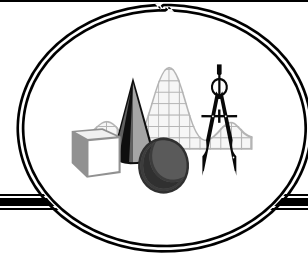


**Definition and illustration (if applicable):**

**numeric or algebraic input into an algorithm,  $n^{\text{th}}$  function, or other defined function**

**Associated terms:**

## arithmetic sequence



**Definition and illustration (if applicable):**

**a sequence in which successive terms have a common difference**

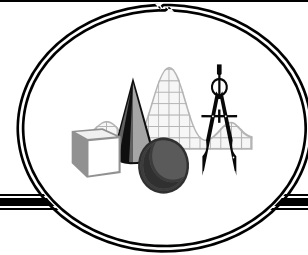
**All arithmetic sequences can be written as  $a_n = a_1 + (n-1)d$  where  $a_n$  is the  $n$ th term of the sequence,  $a_1$  is the first term and  $d$  is the common difference.**

**3, 7, 11, 15, 19 ... is an arithmetic sequence and can be represented by**

$$a_n = 3 + (n-1) 4.$$

**Associated terms:**

## arithmetic series



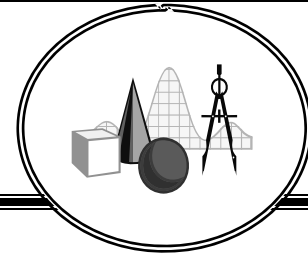
**Definition and illustration (if applicable):**

**the sum of the terms of an arithmetic sequence**

$$S_n = \frac{n}{2}(a_1 + a_n)$$

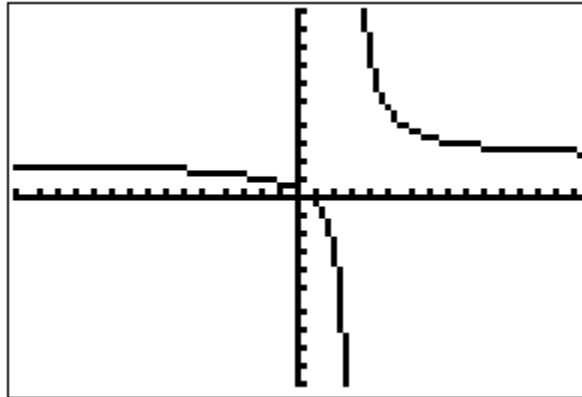
**Associated terms:**

# asymptote



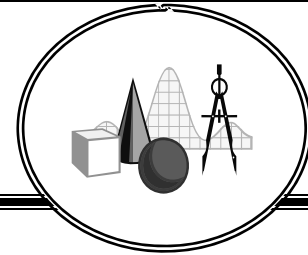
**Definition and illustration (if applicable):**

**a line or curve that approaches a given curve arbitrarily closely**



**Associated terms:**

## binary operation



**Definition and illustration (if applicable):**

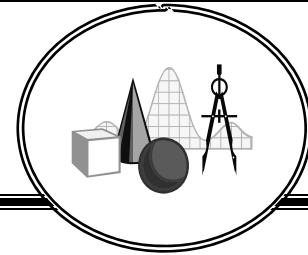
**an action performed on two quantities**

**Addition, subtraction, multiplication, division and exponentiation are binary operations.**

**Associated terms:**



# **binomial**



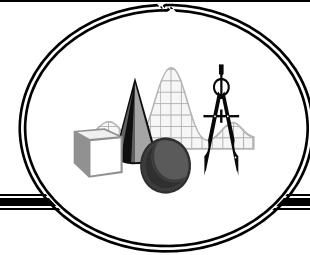
**Definition and illustration (if applicable):**

**the sum or difference of two monomials**

**Associated terms:**

## Algebra Vocabulary

# circle

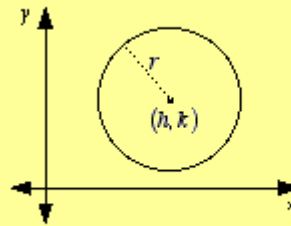


**Definition and illustration (if applicable):**  
the locus of all points that are a fixed distance from a given point

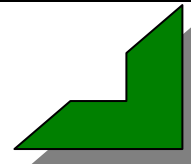
$$(x - h)^2 + (y - k)^2 = r^2$$

Circle with center  $(h, k)$   
and radius  $r$

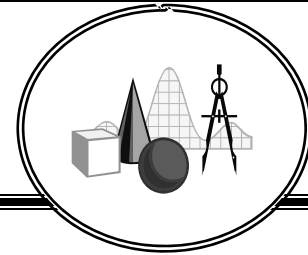
$$\text{Area} = \pi r^2$$



**Associated terms:**



## Closure Property

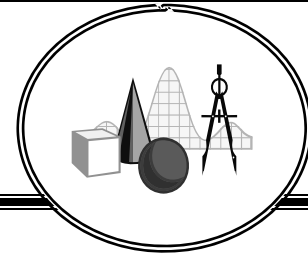


### Definition and illustration (if applicable):

A set is said to be closed under some operation if the operation on members of the set produces a member of the set. A set that is closed under an operation or collection of operations is said to satisfy a closure property. For example, the real numbers are closed under subtraction, where the subset of natural numbers is not.

### Associated terms:

## complex fraction



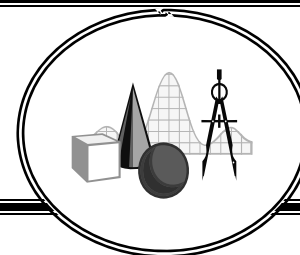
**Definition and illustration (if applicable):**

**a fraction with one or more fractions embedded in the numerator and/or denominator**

$$\frac{\frac{1}{3x}}{\frac{2}{5x} + 6}, \quad \frac{1}{1 + \frac{1}{1+\frac{1}{1}}}$$

**Associated terms:**

## complex number



**Definition and illustration (if applicable):**

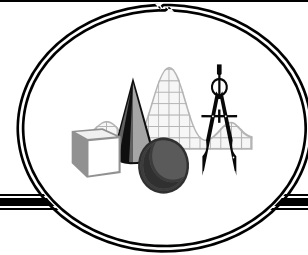
any number that can be written in the form  $a + bi$  where  $a$  and  $b$  are real numbers and  $i$  is  $\sqrt{-1}$  (the square root of -1).

**Note that the set of real numbers is a subset of the set of complex numbers.**

$5 + 3i$ ,  $-6i$ ,  $0$ ,  $\sqrt{2} + i\sqrt{3}$  and  $\pi$   
are complex numbers.

**Associated terms:**

## composition of functions



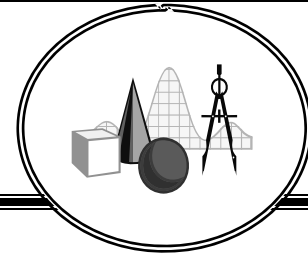
**Definition and illustration (if applicable):**

**combining two functions by taking the output of one and  
using it as the input of another**

**If the output of  $g$  is used as the input of  $f$ , then the composition is referred to as " $f$   
of  $g$  of  $x$ " and is denoted  $f(g(x))$  or  $f \circ g(x)$**

**Associated terms:**

## **consistent system (of equations)**

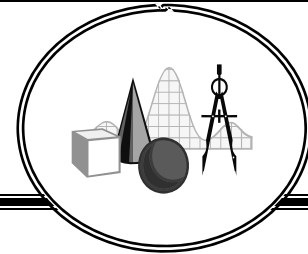


**Definition and illustration (if applicable):**

**a system of equations that has at least one solution**

**Associated terms:** systems of equations

## constant of variation



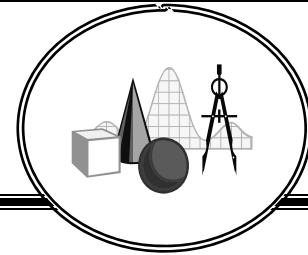
**Definition and illustration (if applicable):**

**the non-zero (usually denoted  $k$ ) in a direct variation ( $y=kx$ ), an indirect variation ( $y=\frac{k}{x}$ ) or a joint variation ( $z=kxy$ )**

**Associated terms: direct variation, joint variation, inverse variation**



## continuous function

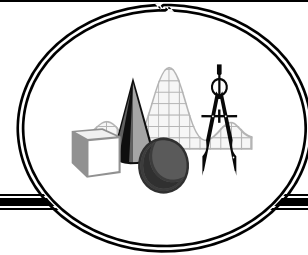


### Definition and illustration (if applicable):

**A function  $f$  is continuous at a point  $(x, y)$  if it is defined at that point and passes through that point without a break.**

### Associated terms:

## decreasing function

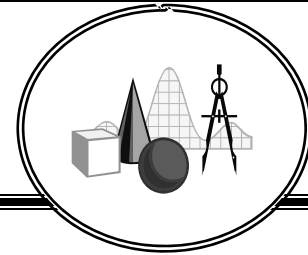


### Definition and illustration (if applicable):

A function  $f$  is decreasing on an interval if and only if for every  $a$  and  $b$  in the interval,  $f(a) > f(b)$  whenever  $a < b$ .

### Associated terms:

## degree (of a polynomial)

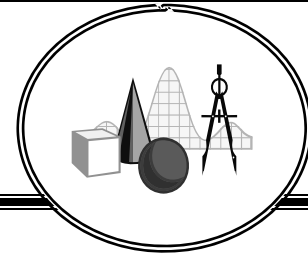


**Definition and illustration (if applicable):**

**the degree of the term with greatest sum of powers.**

**Associated terms:**

## **dependent system of equations**

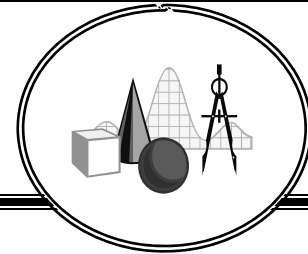


**Definition and illustration (if applicable):**

**system of linear equations where one linear equation is a multiple of the other  
and, therefore, has an infinite number of solutions**

**Associated terms: consistent system, dependent system**

## direct variation

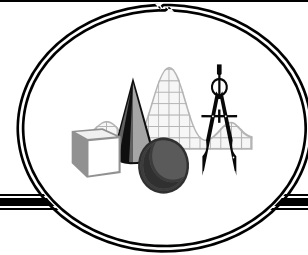


**Definition and illustration (if applicable):**

**a relationship between two variables,  $x$  and  $y$ , that can be expressed as  $y=kx$   
where  $k$  is the constant of variation**

**Associated terms: joint variation, constant of variation, inverse variation**

## discriminant



### Definition and illustration (if applicable):

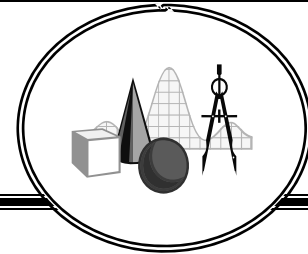
**an algebraic expression related to the coefficients of a quadratic equation that can be used to determine the number and type of solutions to the equation**

If  $ax^2 + bx + c = 0$ , the discriminant is

$$D = b^2 - 4ac$$

### Associated terms:

## domain

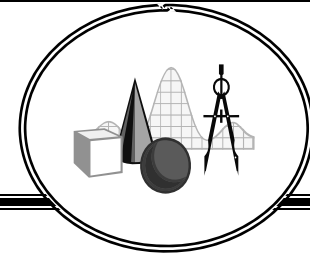


**Definition and illustration (if applicable):**

**the set of independent values in a function; the set of first elements in ordered pairs in a function**

**Associated terms:**

# ellipse



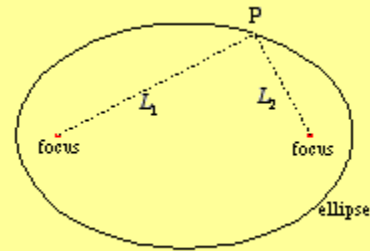
## Definition and illustration (if applicable):

For two given points (the foci), an ellipse is the locus of points such that the sum of the distances to each focus is constant.

The sum  $L_1 + L_2$  is constant, no matter where point P is taken on the ellipse.

Horizontal ellipse:  $L_1 + L_2 = 2a$

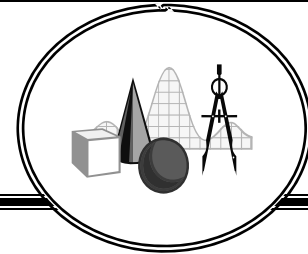
Vertical ellipse:  $L_1 + L_2 = 2b$



## Associated terms:



## function



**Definition and illustration (if applicable):**

a rule that pairs elements from one set, called the domain, to elements from another set, called the range, in such a way that no first element is repeated

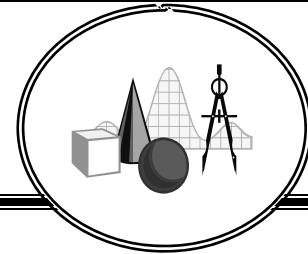
The result is a set of ordered pairs,  $(x, y)$  where each  $x$  value is unique.

Representations of functions include graphs, tables, function notation, mapping diagrams and words.

**Functional notation:** A way to represent a function where a functional name, often  $f$ , is used and the function is written where an independent variable,  $x$ , is the input of the function and  $f(x)$  is the output.

**Associated terms:** increasing function, decreasing function, constant function

## Fundamental Theorem of Algebra



**Definition and illustration (if applicable):**

**Every polynomial equation with degree greater than zero has at least one root in the set of complex numbers.**

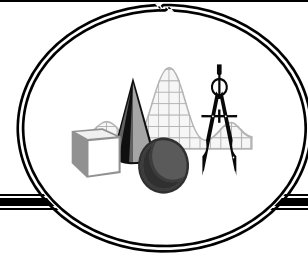
**Corollary: Every polynomial  $P(x)$  of degree  $n$  ( $n > 0$ ) can be written as the product of a constant  $k$  ( $k \neq 0$ ) and  $n$  linear factors**

$$P(x) = k (x - r_1) (x - r_2) (x - r_3) \dots (x - r_n)$$

**Thus a polynomial equation of degree  $n$  has exactly  $n$  complex roots, namely  $r_1, r_2, r_3, \dots, r_n$ .**

**Associated terms:**

## Fundamental Theorem of Arithmetic

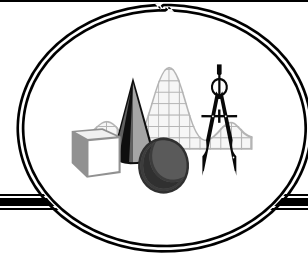


**Definition and illustration (if applicable):**

**In number theory, the Fundamental Theorem of Arithmetic (or unique factorization theorem) states that every natural number greater than 1 can be written as a unique product of prime numbers.**

**Associated terms:**

## geometric sequence



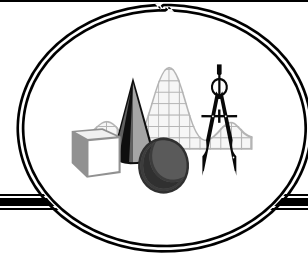
**Definition and illustration (if applicable):**

**a sequence in which consecutive terms have a common ratio**

**All geometric sequences can be written as  $a_n = a_1 r^{n-1}$  where  $a_n$  is the  $n$ th term of the sequence,  $a_1$  is the first term and  $r$  is the common ratio.**

**Associated terms:**

## geometric series



**Definition and illustration (if applicable):**

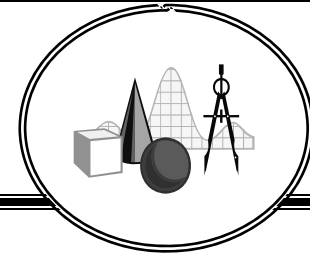
**the sum of the terms of a geometric sequence**

**The sum of the first n terms of a geometric series is given by**

$$S_n = \frac{a_1 - a_1 r^n}{1 - r} .$$

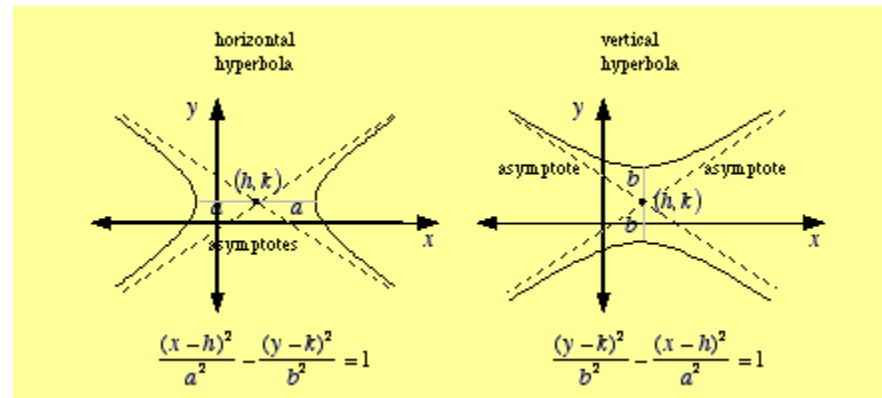
**Associated terms:**

# hyperbola



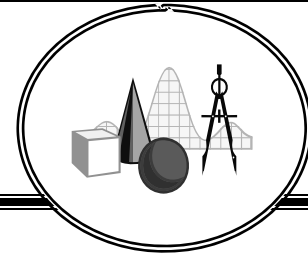
## Definition and illustration (if applicable):

For two given points (the foci), a hyperbola is the locus of points such that the difference between the distances to each focus is constant



## Associated terms:

## **inconsistent system of equations**

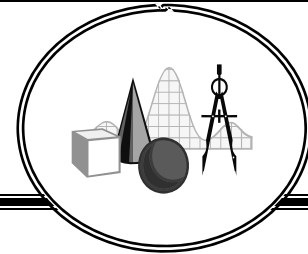


**Definition and illustration (if applicable):**

**system of linear equations that has no solutions; parallel lines**

**Associated terms:**

## increasing function



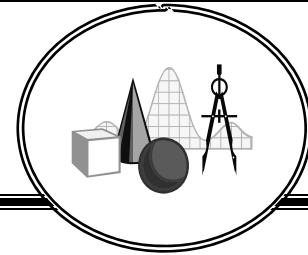
**Definition and illustration (if applicable):**

**A function  $f$  is increasing on an interval if and only if  $f(a) > f(b)$  for every  $a > b$  in the interval.**

**Associated terms:**



## **independent system of equations**

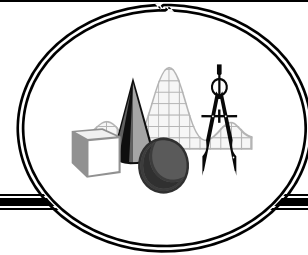


**Definition and illustration (if applicable):**  
**a consistent system of linear equations with only one solution**

**Associated terms:**

## Algebra Vocabulary

### index



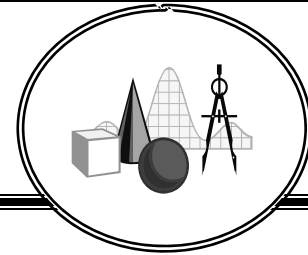
**Definition and illustration (if applicable):**

**number indicating what root is being taken**

$\sqrt[4]{981}$  the index is 4.

**Associated terms:**

## indirect (inverse) variation



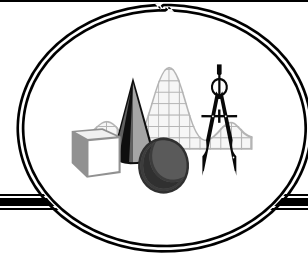
**Definition and illustration (if applicable):**

A relationship between two variables,  $x$  and  $y$ , that can be expressed as  $y = \frac{k}{x}$   
where  $k$  is the constant of variation

**Associated terms:**

Algebra Vocabulary

**x-intercept**  
**y-intercept**

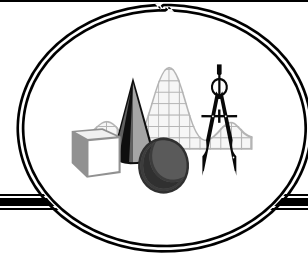


**Definition and illustration (if applicable):**

**point where a curve crosses the x- or y-axis.**

**Associated terms:**

## joint variation



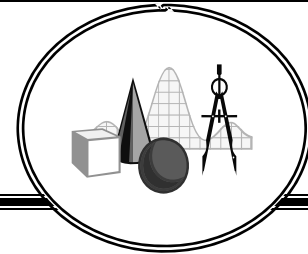
**Definition and illustration (if applicable):**

**a relationship that exists when a quantity varies directly with the product of two or more quantities**

$$y = kxy$$

**Associated terms: direct variation, inverse variation**

## leading coefficient

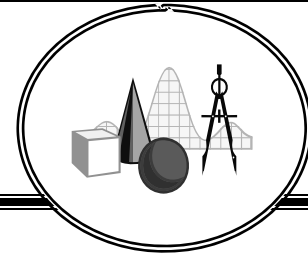


**Definition and illustration (if applicable):**

**In a polynomial function of degree  $n$ , the leading coefficient is  $a_n$  and the leading term is  $a_n x_n$**

**Associated terms:**

## linear function



**Definition and illustration (if applicable):**

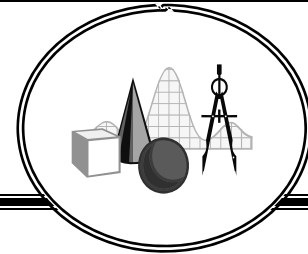
**a function in the form  $y = mx + b$  where  $m$  and  $b$  are constants**

**The graph of a linear function is a line.**

**A linear equation has degree 1.**

**Associated terms:**

## literal equations



**Definition and illustration (if applicable):**

**an equation that contains more than one variable; an implicit equation; often mathematical formulae**

**Associated terms:**



## Algebra Vocabulary

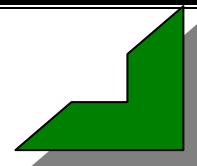
### **matrix**

**Definition and illustration (if applicable):**

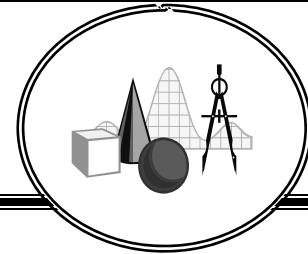
**a rectangular table of elements which may be numbers or any abstract quantities that can be added and multiplied; used to describe linear equations, keep track of the coefficients of linear transformations, and to record data that depend on multiple parameters; a key component of linear algebra; dimensions of a matrix--number of rows and the number of columns of a matrix, written  $r \times c$**

$$\begin{bmatrix} 1 & 5 & 7 & 5 \\ 4 & 3 & 2 & 0 \\ 9 & 8 & 6 & 7 \end{bmatrix}$$

**Associated terms:**



# monomial



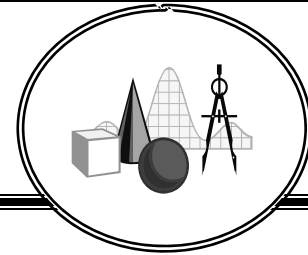
**Definition and illustration (if applicable):**

**a monomial is a product of constants and variables; a polynomial with one term**

$32xy^2z^5$ ,  $2xy$ ,  $x^2yz$ ,  $5$

**Associated terms:**

## one-to-one function

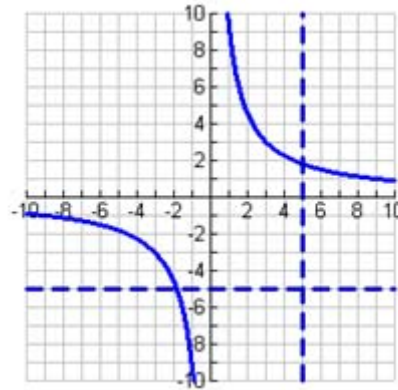


**Definition and illustration (if applicable):**

**a function where every value of  $y$  has a unique value for  $x$**

**If a given function passes the horizontal line test then it is a one-to-one function.**

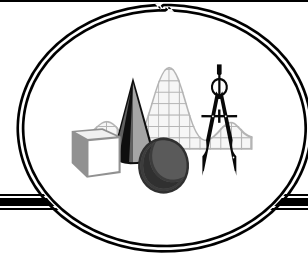
**One-to-one functions have inverses that are also functions.**



**Associated terms: function, increasing function, decreasing function**

## Algebra Vocabulary

### outlier

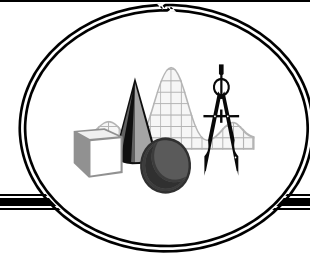


#### **Definition and illustration (if applicable):**

**a value in a data set that is much higher or lower than the rest; a point which falls more than 1.5 times the interquartile range above the third quartile or below the first quartile**

#### **Associated terms:**

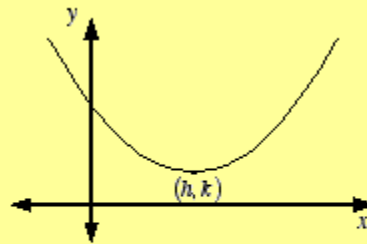
# parabola



**Definition and illustration (if applicable):**

**a locus of points whose perpendicular distances to a line, called the directrix, and to a fixed point, called the focus, are equal**

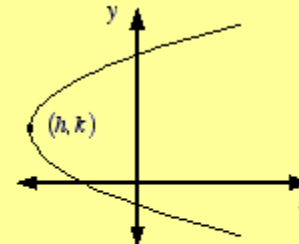
**The graph of any quadratic function is a parabola.**



Vertical Parabola

$$y = a(x - h)^2 + k \text{ or } y - k = a(x - h)^2$$

Note: In this graph,  $a > 0$ . When  $a < 0$ , the parabola is upside down.

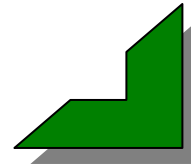


Horizontal Parabola

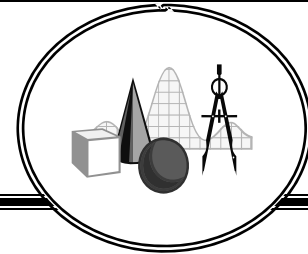
$$x = a(y - k)^2 + h \text{ or } x - h = a(y - k)^2$$

Note: In this graph,  $a > 0$ . When  $a < 0$ , the parabola opens to the left.

**Associated terms:**



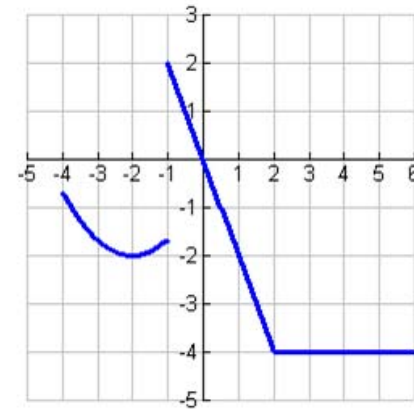
## piecewise function



**Definition and illustration (if applicable):**

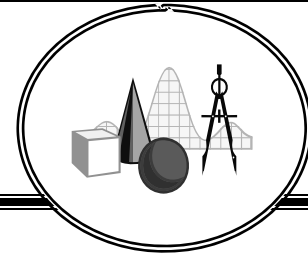
**a function that consists of one or more functions, each with a limited or specified domain; when the pieces are graphed, on the same coordinate plane, the graph may or may not be continuous.**

$$f(x) := \begin{cases} \frac{1}{3}(x+2)^2 - 2 & x \geq -4 \text{ and } x < -1 \\ -2x & x > -1 \text{ and } x < 2 \\ -4 & x \geq 2 \end{cases}$$



**Associated terms: continuous function**

## polynomial function



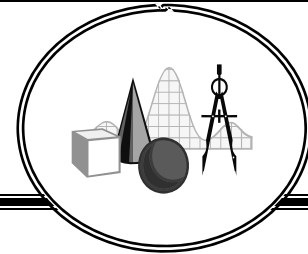
**Definition and illustration (if applicable):**

**a function that can be written as**

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x^1 + a_0$$

**Associated terms:**

## prime polynomial



**Definition and illustration (if applicable):**

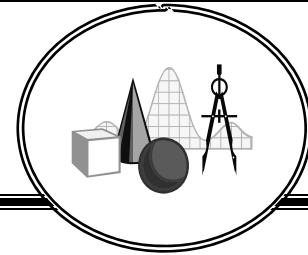
**a polynomial that cannot be factored over the real numbers further;**

**i. e.  $x^2 + 4$**

**Associated terms:**



## quadratic formula



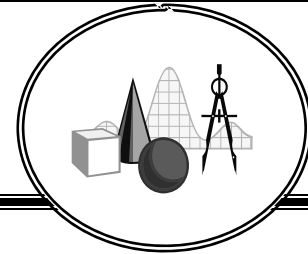
**Definition and illustration (if applicable):**

Given  $ax^2 + bx + c = 0$ , then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Associated terms:**

## quadratic function



**Definition and illustration (if applicable):**

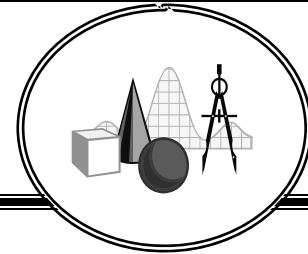
a function that may be written  $f(x)=ax^2 + bx + c$

$$f(x) = \frac{2}{3}x^2 - 5x + 3$$

$$g(t) = t^2 + 23t - 1$$

**Associated terms:**

## radical (nth root)



**Definition and illustration (if applicable):**

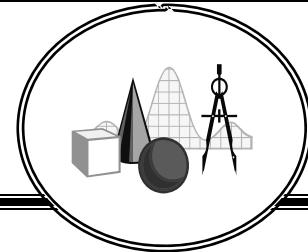
**an expression of the form  $\sqrt[r]{r}$  or  $\sqrt[n]{r}$  where  $r$  is a number or expression**

$$\left(\sqrt[n]{r}\right)^n = r$$

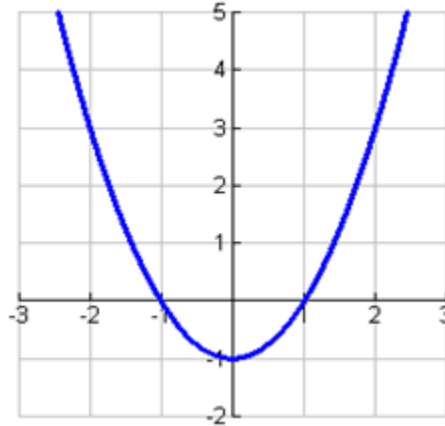
**The radicand is the argument for a radical expression.**

**Associated terms:**

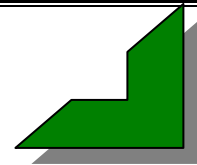
## range (of a function)



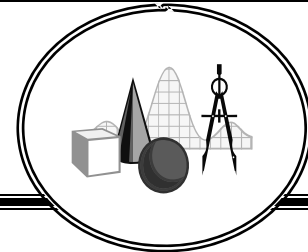
**Definition and illustration (if applicable):**  
the possible values for the dependent variable in a function or relation



**Associated terms:**



## range (of a set of data)

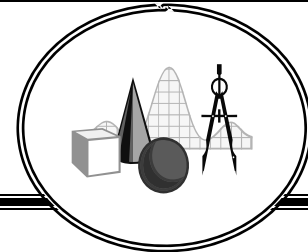


**Definition and illustration (if applicable):**

the difference between the maximum value and the minimum value in a data set  
The range of  $\{5, 7, 9, 2, 4, 7, 1, 7\}$  is 8 because the maximum value is 9 and the minimum value is 1.

**Associated terms:**

## rational functions

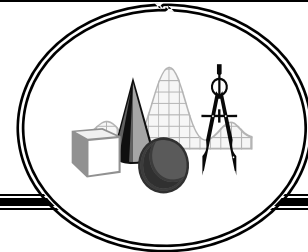


**Definition and illustration (if applicable):**

a function that can be written as  $R(x) = P(x) / Q(x)$  where  $P(x)$  and  $Q(x)$  are polynomials and  $Q(x) \neq 0$ .

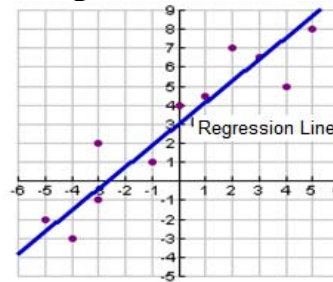
**Associated terms:** function

## regression



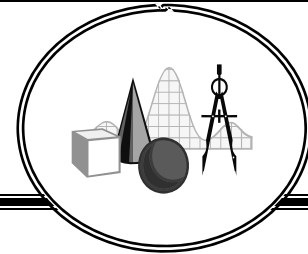
### Definition and illustration (if applicable):

**Linear regression is the process of obtaining the line of best fit. The relationship between two sets of data may be described with a line using some goodness-of-fit criterion. The regression line obtained may be used to describe data and make predictions.**



### Associated terms:

## roots (of a polynomial)



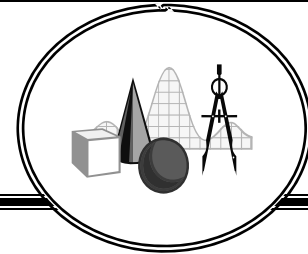
**Definition and illustration (if applicable):**

**A root of a polynomial is a number  $x$  such that  $P(x)=0$ . A polynomial of degree  $n$  has  $n$  roots.**

**Associated terms: Fundamental Theorem of Algebra**



## slope



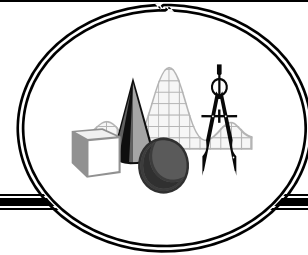
### Definition and illustration (if applicable):

the steepness of a line going from left to right; rise over run; a constant rate of change  
If the line rises from left to right on the graph, then the line has a positive slope; if the line falls from left to right, then it has a negative slope. A horizontal line has a slope of zero. A vertical line has no slope; i. e. the slope is undefined. Slope is calculated using two points on the line. The difference of the y-values is divided by the difference in the x-values (rise divided by run). The symbol for slope is m.

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

### Associated terms:

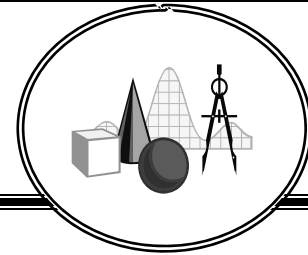
# trinomial



**Definition and illustration (if applicable):**  
a polynomial expression with three terms

**Associated terms:**

## zeros (of a function)



**Definition and illustration (if applicable):**

a value of  $x$  for which  $f(x) = 0$

**Associated terms:**