Course Glossary

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A

Altitude of a Triangle
The altitude of a triangle is a perpendicular line through a vertex of the triangle to its opposite side.

Arithmetic Sequence
An arithmetic sequence is a list of numbers, called terms, which share a common difference.
Example: –5, –7, –9, –11 … or 8, 23, 38, 53 …

Arithmetic Series
An arithmetic series is a list of numbers, called terms, separated by a common difference, that are being added together.
Example: –5 + –7 + –9 + –11 or 8 + 23 + 38

Ascending Order
A polynomial is arranged in ascending order by listing its terms in order from least degree to greatest degree.

Asymptote
An asymptote is an imaginary line that the graph of a function approaches more and more closely. Graphs will never cross a vertical asymptote, but may cross a horizontal or oblique asymptote.

Axis of Symmetry
An axis of symmetry is a line which splits a graph into two halves so that the halves are mirror images of one another.

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C

Change of Base Formula
The Change of Base formula allows you to find the value of a logarithm with a base other than 10

using a calculator. Divide the common logarithm of the argument by the common logarithm of the base.

Example: To find the value of $\log_2 8$, divide the common log of 8 by the common log of 2.

$$\log_2 8 = \frac{\log 8}{\log 2} \approx \frac{0.903089987}{0.3010299957} = 3$$

Coefficient

A coefficient is a number multiplied by a variable. In the term $56x^2y$, the coefficient is 56.

Common Logarithm

A logarithm with a base of 10 is known as the common log. When a logarithmic equation or expression does not show a base, the base is assumed to be 10. Most graphing calculators and other forms of technology will only allow you to graph and calculate logarithms of base 10.

Example: $\log_{10} 10 = \log 10 = 1$

Complex Fraction

A complex fraction is a fraction in which the numerator, denominator, or both contain a fraction.

Example: $\dfrac{\dfrac{x-1}{3}}{\dfrac{x+5}{18}}$

Complex Number

Complex numbers consist of one term that is a real number and another term that is imaginary.

Real Number $\longrightarrow$ $7 + 10i$ $\longleftarrow$ Imaginary Number

Any complex number can be written in the form a + bi, where a represents the real number term and b represents the imaginary number term.

Composite Number

A composite number is a whole number, not equal to 1, that is not prime.

Conic Section

A conic section is a geometric figure formed from slicing a plane through a double cone. The four conic sections are parabola, circle, ellipse, and hyperbola.

Conjugate

A binomial whose terms are identical to another binomial, but with the opposite sign separating those terms.

Conjugate Axis of a Hyperbola

The conjugate axis of a hyperbola is a segment perpendicular to the transverse axis. The conjugate axis passes through the center of the hyperbola.

Conjugate Root Theorem

The Conjugate Root Theorem states that if a complex number, such as $4 - i$, is a zero of a polynomial with real coefficients, then its conjugate, $4 + i$, must also be a zero of that function.

Cube Root

A cube root is the number or variable which results from separating an expression into three identical groups which are multiplied together.

D

Degree

In equations with only one variable, the degree is represented by the highest exponent. In equations with more than one variable, the degree is indicated by the term with the highest sum of exponents.
Example:
$x^3 - 4x^2 + 5x - 1$; degree: 3
$5x^2y^2 - 6x^2y + 5xy^2 - 10$; degree: 4

Depressed Equation

A depressed equation is the result when a function is divided by one of its roots or zeros.
Example: A zero of $f(x) = x^3 + 3x^2 - 22x - 24$ is 4.

The depressed equation is $f(x) = 1x^2 + 7x + 6$.

Descartes' Rule of Signs

Descartes' Rule of Signs narrows the possible rational zeros of a function by identifying the number of positive real, negative real and complex zeros.

Descending Order

A polynomial is arranged in descending order by listing its terms in order from greatest degree to least degree.

Difference of Squares Binomial

A difference of squares binomial is an expression where two perfect square terms are being subtracted. It follows the pattern $a^2 - b^2 = (a + b)(a - b)$.

Direct Variation

A direct variation is a relationship between two variables such that as one variable increases, the other variable also increases. Similarly, if one variable decreases, the other variable will also decrease. All direct variation equations take the form of $y = kx^n$.

Directrices of a Hyperbola

The directrices of a hyperbola are two perpendicular lines to the transverse axis on the interior of the ellipse. These directrices can be found with the equation $x = \pm \dfrac{a^2}{c}$ for horizontal hyperbolas and $y = \pm \dfrac{a^2}{c}$ for vertical hyperbolas. In this formula, a is the distance between the hyperbola's center and a vertex and c is the distance from the center to the foci.

Directrices of an Ellipse

The directrices of an ellipse are two perpendicular lines to the major axis on the exterior of the ellipse. These directrices can be found with the equation x = $\frac{a^2}{c}$ for horizontal ellipses and y = $\frac{a^2}{c}$. In this formula, a is the distance between the ellipse's center and a vertex and c is the distance from the center to the foci.

Directrix of a Circle
The directrix of a circle is a line perpendicular to its axis of symmetry. Since there are infinitely many axes of symmetry, there are infinitely many directrices of a circle.

Directrix of a Parabola
The directrix of a parabola is a line perpendicular to the axis of symmetry. It lies on the opposite side of the vertex from the focus.

Discontinuity
A discontinuity of a rational function is a point in the graph of a function where the function does not exist.

Distributive Property of Equality
The Distributive Property says that when multiplying a factor and a quantity in parentheses, multiply the factor to each term inside the parentheses.

$5(3x + 2) = 15x + 10$ $-2(x - 1) = -2x + 2$

Domain
The domain is a group of numbers that can be substituted for the variable x and produce a unique value for y.

Double Root
When two identical solutions appear in a quadratic or polynomial equation, those two solutions are said to be a double root.

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Eccentricity
The eccentricity of a conic section is a number that describes the shape of its graph. It is represented by the distance from a point on the graph to its focus divided by the distance from the same point to its directrix.

- The eccentricity of a parabola is 1.
- The eccentricity of a circle is 0.
- The eccentricity of an ellipse is between 0 and 1.
- The eccentricity of a hyperbola is greater than 1.

Equality Property of Logarithms
$\log_b x = \log_b y \iff x = y$

In an equation where two logarithmic expressions with identical bases are equal to each other, the arguments of those expressions are also equal.

Example: If $\log_4 x = \log_4 y$, then $x = y$.

Exponent

A small raised number which indicates how many times a number, variable, or quantity is to be multiplied with itself.

Exponential Decay Function

An exponential decay function is a function where the initial amount decreases significantly as time passes.

Example: $A(t) = \$15{,}000 \left(\dfrac{4}{5}\right)^t$

Exponential Function

An exponential function is a function where the variable is located in the exponent and the base of the function is a positive real number not equal to 1.

Example: $f(x) = 3^x$

Exponential Growth Function

An exponential growth function is a function where the initial amount grows significantly as time passes.

Example: $A(t) = \$0.01(2)^t$

Expression

An expression is any combination of constants, variables, or coefficients and variables that is not set equal to anything.

Extraneous Solution

A solution to an equation that does not fit the requirements of the original equation.

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Factor

An integer or variable multiplied by other integers or variables that create a resulting product. factor • factor = product.

Factor Theorem

The Factor Theorem states that a first-degree binomial is a factor of a function if the remainder is zero when the function is divided by the binomial.

Foci of a Hyperbola

The foci of a hyperbola are two points inside the hyperbola. The difference of distances between each focus and the graph is constant.

Foci of an Ellipse

The foci of an ellipse are two points inside the ellipse that lie along the major axis. The sum of

distances between each focus and the graph is constant.

Focus of a Circle

The focus of a circle is the center of that circle.

Focus of a Parabola

The focus of a parabola is a point that lies on the axis of symmetry, inside the opening of the parabola. All points on the parabola are equidistant from the focus and the directrix.

Function

A function is a set of ordered pairs where every x-coordinate has one, and only one, distinct corresponding y-coordinate. Graphically, a set of ordered pairs is a function if a line connecting those points passes the vertical line test. If a vertical line can be dragged from left to right across the graph without the vertical line crossing more than one point at a time on the graph, the equation is a function.

Fundamental Theorem of Algebra

The Fundamental Theorem of Algebra generally states that the degree of a polynomial is equal to the number of zeros of a function, both real and complex. By the Fundamental Theorem of Algebra, the function $f(x) = x^2 - 3x - 28$ has two zeros since the degree of the function is two.

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G

Geometric Sequence

A geometric sequence is a list of numbers, called terms, which share a common ratio.
Example: 1, 4, 16… or 2, –6, 18 …

Geometric Series

A geometric series is the sum of a list of numbers (called terms) that are separated by a common ratio.
Example: 2 + –2 + 2 … or 7 + 14 + 28 …

Greatest Common Factor or GCF

The GCF, or greatest common factor, of two or more terms is the largest factor that all terms have in common.

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Horizontal Line

A horizontal line has an equation in the form y = b, where b is any real number. For example, the graph of the equation y = –1 is a horizontal line that crosses the y-axis at –1.

I

Imaginary Number

The imaginary number i is defined to be i = $\sqrt{-1}$. An imaginary number, in general, is any real number times i.

Example: 3i, –4i, and $\frac{1}{2}$i are all imaginary numbers.

Inequalities

A mathematical statement containing one of the following symbols: > "greater than," < "less than," ≥ "greater than or equal to," or ≤ "less than or equal to."

Infinite Convergent Geometric Series

A convergent geometric series is a geometric series that continues without end and has a common ratio with absolute value less than 1 (|r| ≠ 0). The sum of an infinite convergent geometric series approaches a single number.

Example:

$$\sum_{i=1}^{\infty} 90\left(\frac{1}{10}\right)^{i-1} = 90 + 9 + 0.9 + 0.09 + 0.009 \ldots = 99.999$$

Since $\left|\frac{1}{10}\right| < 1$, the series is convergent. Its sum is found to be 100.

Infinite Divergent Geometric Series

A divergent geometric series is a geometric series that continues without end and has a common ratio with absolute value greater than 1. The sum of an infinite divergent geometric series cannot be found.
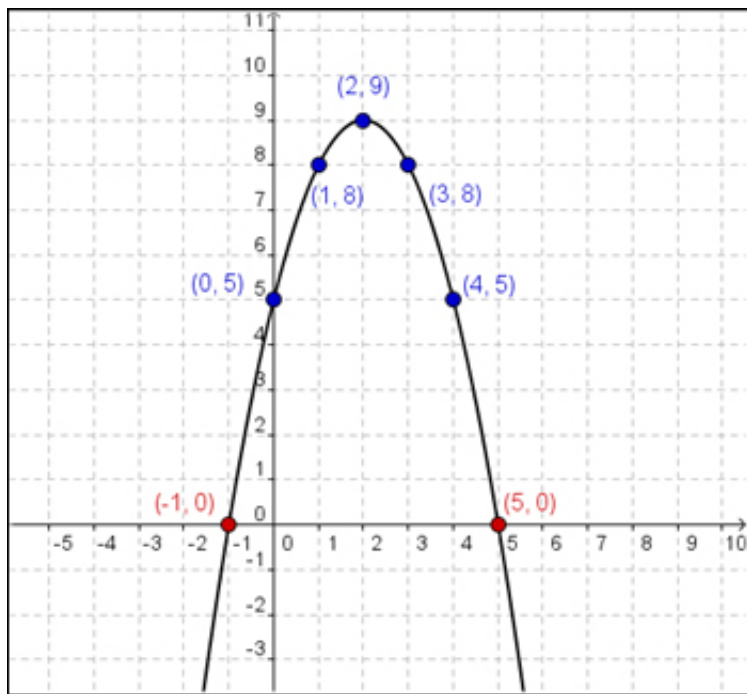
Example:

$$\sum_{i=1}^{\infty} 4(-3)^{i-1} = 4 - 12 + 36 - 108 + 324 - 972 + \ldots$$

Since $|-3|$ 1, the series is divergent. Its sum cannot be found.

Intercepts

The intercepts of a quadratic equation are the places on the graph where the parabola crosses the x- or y-axis. The x-intercepts are found by looking at the graph of the parabola where it crosses the x-axis.

The y-intercepts are found by looking at where the parabola crosses the y-axis or by substituting 0 for x in the equation and solving for y.

$y = -(x - 2)^2 + 9$

$y = -(0 - 2)^2 + 9$

$y = -(-2)^2 + 9$

$y = -(4) + 9$

$y = -4 + 9$

$y = 5$

Inverse Variation

An inverse variation is a relationship between two variables such that as one variable increases, the other variable decreases. All inverse variation equations take the form of

$$y = \frac{k}{x^n}$$

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J

Joint Variation

A joint variation is a relationship between three or more variables such that as one variable increases, all other variables also increase. Similarly, if one variable decreases, all other variables will also decrease. Joint variation equations with three variables take the form of

$y = k(x^n)(z^m)$.

L

Leading Coefficient
A leading coefficient is the number by which the variable with the greatest exponent is multiplied.
Least Common Denominator
A least common denominator is the least common multiple between given denominators.
Least Common Multiple
The least common multiple is the smallest number between a group of numbers into which all may be multiplied.
**Line of Best Fit**
A line of best fit is a line through a series of data points which models the trend of those points. Some data points will be directly on the line, but most points will be on either side.

A line of best fit has other names, such as a trendline or a regression. The advanced math techniques used to determine the line of best fit will be presented in future math courses and typically use a spreadsheet, calculator, or custom computer program. The techniques taught in this course will develop a line of good fit for the data, but for simplification are called 'best fit.'
Linear Equation
A linear equation is an equation where the highest exponent on the variables (also known as the degree) is 1. The simplest linear equation is $y = x$ where every value of x is the same as the corresponding y value. The graph looks like
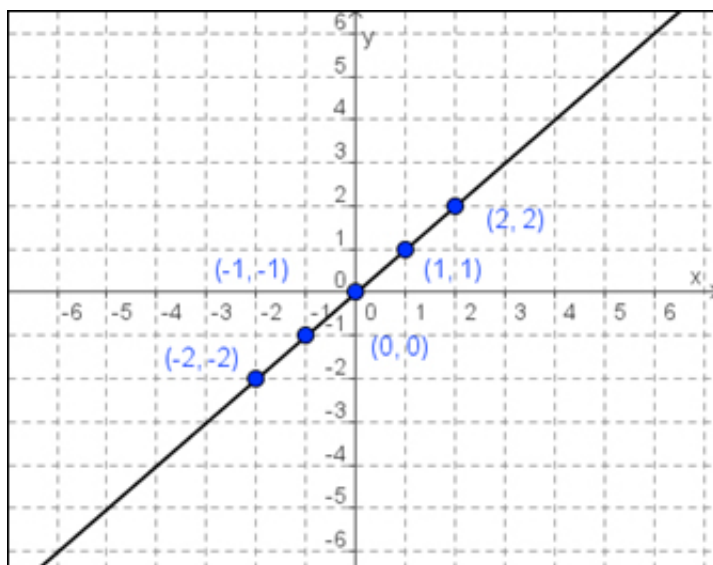

Literal Equations
A literal equation is an equation with multiple variables. Solving a literal equation means to solve for one of these specific variables.

Logarithmic Function

A logarithmic function is the inverse of an exponential function. A logarithmic function is written in the format

$x = \log_b y$ where x is the power, b is the base, and y is the argument. The graph of a logarithmic function is the graph of an exponential function reflected across the line y = x.

Example:
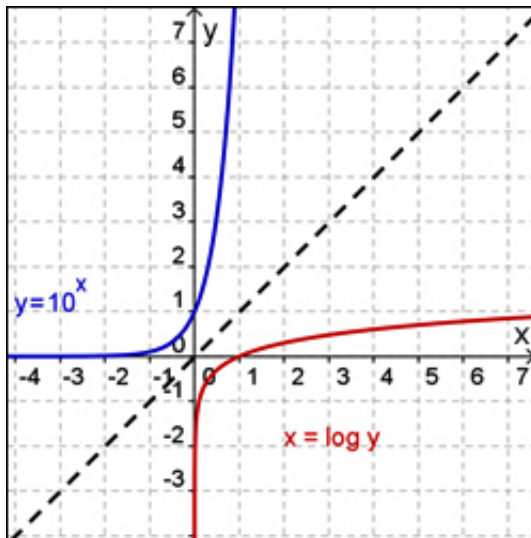
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M

Major Axis of an Ellipse

The major axis of an ellipse is the distance between the vertices. It passes through the center and foci of the ellipse.

Matrix

A matrix is an arrangement of numbers in a rectangular pattern, surrounded by brackets, such as

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \text{ or } \begin{bmatrix} 9 & -3 & 7 \\ -1 & 5 & -4 \\ 3 & -5 & 1 \end{bmatrix} \text{ or } \begin{bmatrix} -3 & 4 & 7 \end{bmatrix}$$

Minor Axis of an Ellipse

The minor axis of an ellipse is a segment perpendicular to the major axis at its center. The endpoints of the minor axis lie on the ellipse.

Monomial

A monomial is a polynomial with exactly one term. This term could be a constant, a variable, or a variable with a coefficient.

Example: 9 or y^4 or 10x

Multiplicity

The term multiplicity refers to the number of times a zero of a function occurs. For example, if –4 is a zero with multiplicity 3 of the function $f(x) = x^3 + 12x^2 + 48x + 64$, then x = –4, x = –4, and x = –4 when f(x) = 0.

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Natural Logarithm
A logarithm with base e, where e is equal to 2.718218… is known as the natural logarithm. The abbreviation ln is used in expressions and equations to indicate the natural log.

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O

Opposite Coefficients
Opposite coefficients are a pair of numbers multiplied by the same variable but with opposite signs.
Examples:
3x and –3x
7f and –7f
15z and –15z

Ordered Pair
An ordered pair is two numbers inside a set of parentheses separated by a comma. The first number is called the x-coordinate and the second number is called the y-coordinate.

Orthocenter of a Triangle
The orthocenter is the point of intersection among the three altitudes of a triangle.

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P

Parabola
The shape of a quadratic equation's graph, which looks like an arc. The general form of the equation is represented by $y = a(x - h)^2 + k$

Partial Sum
A partial sum is the sum of a limited number of terms contained within an infinite series.

Perfect Cube

Geometrically, a perfect cube, or just cube, is a three-dimensional object whose length, width and height are all the same measurement. Algebraically, a perfect cube is the product of three identical numbers or variables multiplied together.

Example:

The number 8 is a perfect cube since the cube root of 8 is 2.

$2 \cdot 2 \cdot 2 = 8$

Perfect Square Trinomial

A perfect square trinomial is a three-term expression where the first and last terms are perfect squares and the middle term is twice the product of the square roots of those terms. It follows the pattern:

$a^2 + 2ab + b^2 = (a + b)^2$ OR $a^2 - 2ab + b^2 = (a - b)^2$.

Perpendicular Bisector

A perpendicular bisector is a line or segment that passes through the middle of another line or segment at a 90° angle.

Point-Slope Form of a Linear Equation

The point-slope form of a linear equation is given by $y - y_1 = m(x - x_1)$, where m represents the slope and (x_1, y_1) is a point on that line.

Polynomial

A polynomial is an expression consisting of a term or terms that contain at least one variable raised to a positive integer. When a polynomial is set equal to a constant or other polynomial expression, it is a polynomial equation.

Power of a Power Property

To raise a power to a power, multiply the exponents.

$$\left(a^m\right)^n = a^{m \cdot n}$$

Example: $\left(a^5\right)^3 = a^5 \cdot a^5 \cdot a^5 = a^{5 \cdot 3}$

Power Property of Logarithms

$\log_b x^y = y \log_b x$

The exponent on the argument of a logarithmic term or factor is also the coefficient of that entire term or factor.

Example: $\log_7 2^3 = 3 \log_7 2$

Prime

A number or expression that can be divided by only one and itself.

Prime Number

A prime number is a whole number that is only divisible by 1 and itself.

Product of a Power Property

To multiply powers of the same base, add the exponents.

$$a^m \cdot a^n = a^{m+n}$$

Example: $a^2 \cdot a^3 = (a \cdot a) \cdot (a \cdot a \cdot a) = a^5 = a^{2+3}$

Product Property of Logarithms

log_b x + log_b y = log_b xy

If two or more logarithmic expressions with the same base are added, multiply the arguments to get the sum.

Example: log_7 3 + log_7 5 = log_7 (3)(5) = log_7 15

Proportion

When one fraction equals another fraction, the two fractions are in proportion to one another and can be solved by cross multiplying.

Example: $\frac{x}{3} = \frac{8}{12}$

12x = 24

x = 2

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Q

Quadratic Equation

A quadratic equation is an equation of degree 2. The standard form of the quadratic equation is represented by y = ax^2 + bx + c

Quotient of a Power Property

To divide powers of the same base, subtract the exponents.

$$a^m \div a^n = a^{m-n}$$

Example: $\frac{a^5}{a^3} = \frac{\cancel{a} \cdot \cancel{a} \cdot \cancel{a} \cdot a \cdot a}{\cancel{a} \cdot \cancel{a} \cdot \cancel{a}} = a^2 = a^{5-3}$

Quotient of a Power Property

log_b x – log_b y = log_b

If two or more logarithmic expressions with the same base are subtracted, divide the first argument by the second argument to get the difference.

Example: log_7 40 – log_7 8 = log_7 (40 ÷ 8) = log_7 5

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R

Radical Equations

A radical equation is an equation where a variable is, or is a part of, the radicand.
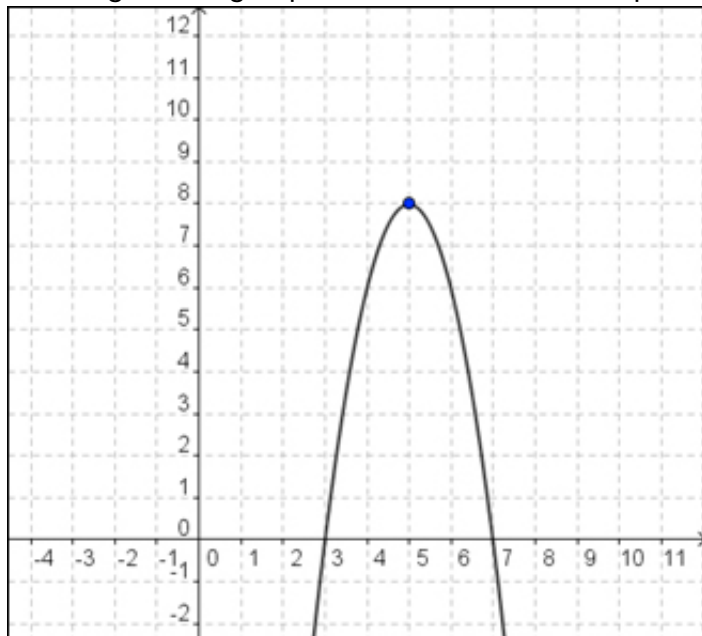
Radicand

A radicand is the term or expression underneath a radical sign.

index $\longrightarrow$ $\sqrt[3]{4x^5}$

radicand

Range

The range is the group of numbers that can be produced from all of the domain values.

The vertex of the parabola is (5, 8). The parabola opens down so the vertex represents the maximum point on the parabola. All of the y-values must be below that y-coordinate of 8. Therefore, the range of this equation is y ≤ 8.
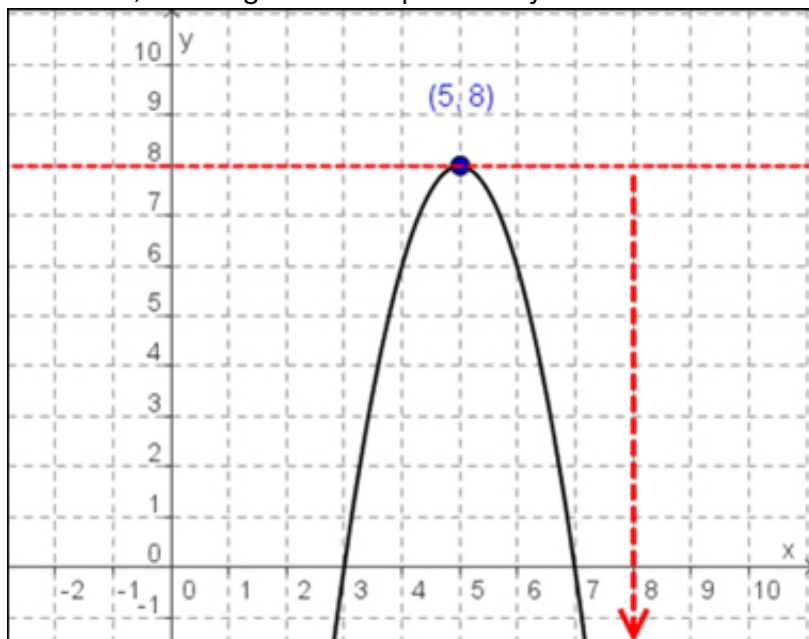
Rational Equation

A rational equation is an equation containing one or more rational terms.

Example: $\dfrac{11}{8x} - \dfrac{1}{x+3} = \dfrac{3}{4x}$

Rational Expression

A rational expression is a fraction that contains a polynomial in both the numerator and denominator.

Example: $\dfrac{5x+35}{5x}$ or $\dfrac{x^2+6x-27}{x+9}$

Rational Root Theorem

The Rational Root Theorem provides a list of all the possible rational zeros of a function. This list is created by dividing each factor of the constant term, p, by each factor of the leading coefficient, q.

Rationalizing the Denominator

Rationalizing the denominator is a process by which the irrational or complex denominator of a fraction is turned into a rational number.

Reciprocal

A reciprocal is a fraction that has been flipped upside-down. The numerator exchanges places with the denominator and vice versa. The product of a number and its reciprocal is 1.

Example: The reciprocal of $\dfrac{2}{7}$ is $\dfrac{7}{2}$ because $\dfrac{2}{7} \cdot \dfrac{7}{2} = \dfrac{14}{14} = 1$

Example: The reciprocal of 18 is $\dfrac{1}{18}$ because $18 \cdot \dfrac{1}{18} = 1$

To find the reciprocal of a fraction, interchange its numerator and denominator.

Remainder Theorem

The Remainder Theorem states that when the opposite constant in the binomial divisor is substituted into a function for x, the result is equal to the remainder.

Root of a Function

A root is the value of x when the function equals 0. It has the same meaning as a zero of a function.

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S

Scatter Plot

A scatter plot is a graphical representation of two distinct sets of data.

Sequence

A sequence is a list of numbers separated by commas.

Series

A series is the terms of a sequence added together.

Example: In the sequence 1, 2, 4, 7, 11 the series is

1 + 2 + 4 + 7 + 11.

Sigma Notation

Sigma notation is a method of writing a long series of numbers in an abbreviated format. Sigma notation uses the Greek letter sigma, Σ, which is the equivalent of the English "S."

Slope

The slope of a line is the ratio of the vertical change to the horizontal change between any two points on the line. Given two ordered pairs (x_1, y_1) and (x_2, y_2), the slope of a line can be found using the formula $\frac{y_2 - y_1}{x_2 - x_1}$.

Slope-Intercept Form of a Line

The slope-intercept form of a line is $y = mx + b$, where m is the slope of the line and b is the y-intercept.

Slope-Intercept Form of a Linear Equation

The slope-intercept form of a linear equation is given by $y = mx + b$, where m represents the slope and b is the
y-intercept.

Standard Form of a Linear Equation

The standard form of the equation of a line is given by the equation $ax + by = c$, where a is a positive integer.

Example: $2x - 3y = 10$

Symmetrical

A figure is said to be symmetrical when two halves are equal in size and shape.

System of Equations

A system of equations is two or more equations with the same variables.

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T

Term

A term is any constant, variable, or coefficient and its variable(s). Terms are separated by addition or subtraction signs.

Trajectory

A trajectory is the path a moving object follows through space.

Transverse Axis of a Hyperbola

The transverse axis is a segment with endpoints at the two vertices of the hyperbola. It passes

through the center. It does not pass through the foci.

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V

Vertex
The vertex of a graph is the turning point of the graph.
Vertical Line
A vertical line has an equation in the form x = a, where a is any real number. For example, the graph of the equation x = 3 is a vertical line that crosses the x-axis at 3.
Vertical Line Test
The Vertical Line Test is a test used to determine whether an equation is a function by examining its graph. The equation passes the test when a vertical line intersects, at most, one point on the graph at a time.

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Z

Zero Product Property
When you first learned your multiplication tables, you easily remembered that 0 times any number was 0.

$0 \cdot 5 = 0, 0 \cdot -7 = 0, 0 \cdot 1 = 0, 0 \cdot \dfrac{1}{2} = 0, 0 \cdot 0 = 0$

The zero product property says if two factors are multiplied and equal 0, then one or both of those factors must equal 0.
Zeros of a Function
A zero of a function is a solution, or x value, of the function when the equation equals zero.

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