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Intro to Calculus	2008/2009	Unit 1

Translating mathematical symbols into English can make solving problems easier.

Absolute value can be used to represent the distance between two points.

Interval notation typically is made up of a left grouping symbol, two values separated by a comma, and a right grouping symbol

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Graphs and equations can be used in conjunction to help solve problems.

Many concepts are connected to the Pythagorean Theorem.

Function notation is a different form of representing relationships between quantities. This is not a new idea, just a new way to represent an idea (equations) which you have been dealing with for a long time.

Not all relationships are functions. A relationship is a function if and only if for any x-value in the domain of the function there is only one corresponding y-value.

Three ways to determine if a relationship is a function: graphs, tables of values, equations.

The domain of a function are the values which do not “break” the function.

You can create functions by combining (compositing) other functions.

It is important to be able to move back and forth fluently between the graph of a function and the equation representing the function.

Functions can undo other functions.

If you graph a function and the function which undoes it, then the graphs will be reflections of each other across the line y = x.

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Functions which undo each other are called “inverses”.

The notation for inverse functions can be tricky-- f^-1 would be the inverse of the function f. The “-1” symbol’s location is crucial and looks a lot like other uses.

Graphs of functions can be transformed by shifting, flipping, compressing, or combination of these.

How the graph of a function changes can be described using both words and algebra.

An optimal solution can be found by creating function, graphing the function, and then finding the maximum or minimum value.

The locations where the graph of a function crosses the x-axis can be used to find factors of the function.

A polynomial can have up to as many roots as its degree.

A polynomial function is smooth and has a domain of all real numbers.

The graphs of some polynomials functions do not have x-intercepts. The x-intercepts represent the real roots, or zeroes, of the function.

The locations where the graph of a function crosses the x-axis can be used to find factors of the function.

A polynomial function is created when a series of terms are connected with addition such that each term is comprised of a real number coefficient and a variable raised to a whole number power. (This is not really a definition, but it captures what will be most important to us.)

The domain of a polynomial is all real numbers. Hence the graph of a polynomial will have to breaks.

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Graphs of polynomials are smooth-- no pointy parts.

Graphs of polynomials have no horizontal asymptotes.

A lower bound for the degree of a polynomial can be inferred from the “bumps” on the graph of the polynomial.

The behavior at the “ends” of a polynomial (way out where x is really small or really big) can be used to determine if the degree of the polynomial is odd or even and whether the coefficient of the highest degree term (the lead coefficient) is positive or negative.

The behavior of the graph of the polynomial at the locations where it crosses the x-axis can be used to tell you the multiplicity of the real roots of the function-- tells you what degree each factored term has to be raised to.

A negative exponent represent the reciprocal of the base.

When multiplying expressions with the same base, the exponents can be added.

When dividing expressions with the same base, the exponents can be subtracted.

Exponential growth and decay are characterized by a constant multiplier.

Exponential growth and decay arise from situations where each “individual” creates new “individuals”.

Exponential growth or dcay can be modeled by the function f(t) = Cb^t where C represents the starting value or initial population, b represents the exponential constant, and t represents the # of cycles of growth.

Growth of money in an investment gaining interest can be thought of as continuous growth-- the principal is accumulating interest, and the interest is accumulating interest, and the interest on the interest is accumulating interest on a continuous basis.

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The number e can be thought of as the total amount of money in an account which started with $1, was growing at a rate of 100% per year, and had an infinite number of compounding periods (compounded continuously) at the end of one year.

There are two types of questions we can ask concerning exponential: 1) Given the number of growth cycles, determine the quantity; 2) Given the quantity, determine the number of growth cycles. These questions are inverses of each other.

A logarithm is an exponential equation in disguise.

Problems involving logarithms can be solved by first translating the problem into one invovling exponents and then solving this exponent problem.

There are three fundamental properties of logarithms: the multiplication property, the division property, and the power property.
