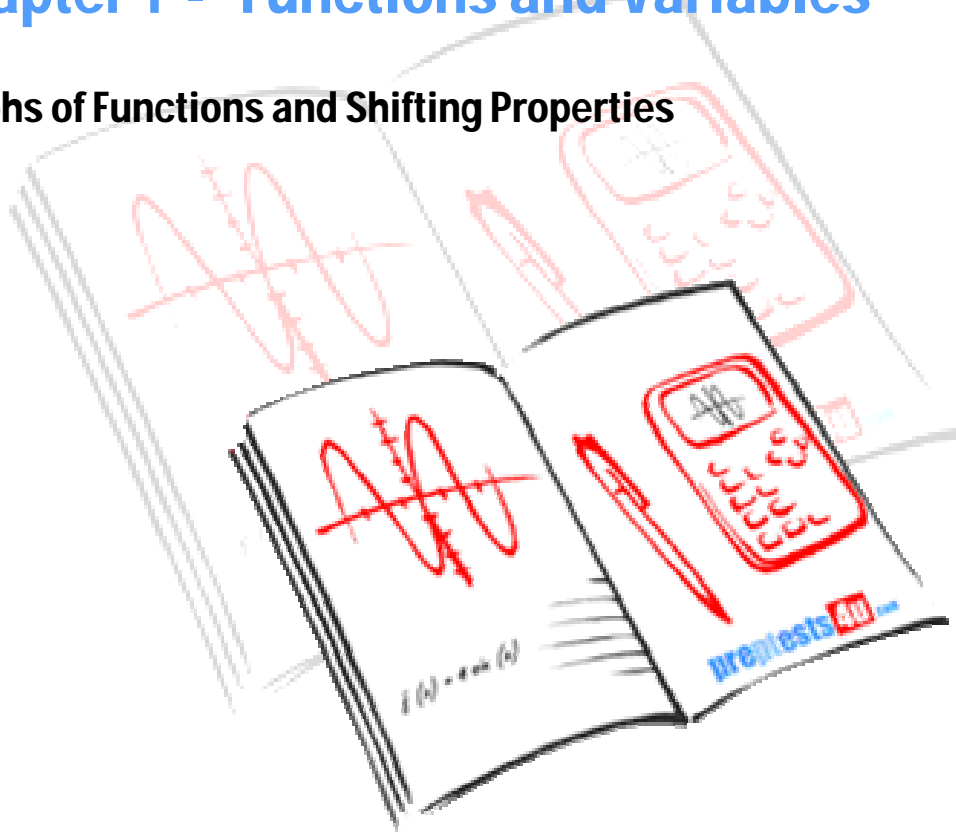


Calculus 1

Chapter 1 - Functions and Variables

Graphs of Functions and Shifting Properties



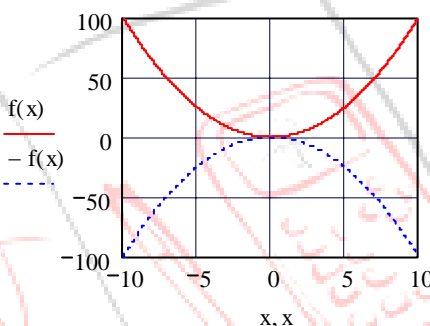
Graphs of Functions and Shifting Properties

In this section, we outline the steps to graphing the functions by finding important points of the graph. In order to apply the shifting properties, one should become familiar with some of the most common graphs of equations as bases for such transformation. For instance, knowing the graphs of $f(x) = x^2$ or $f(x) = x^3$, it is possible to graph any quadratic equation or polynomials of degree three, respectively.

The graphs of some of the commonly used functions are given as follow.

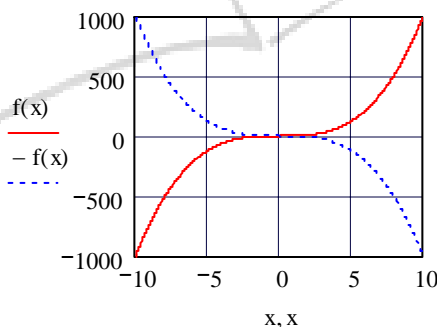
Parabola

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



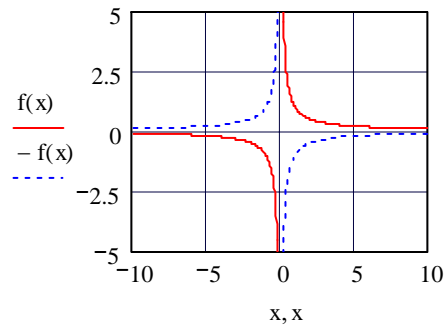
Cubic Function

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



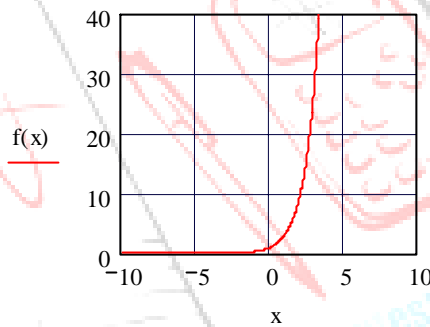
Hyperbola

Equation: $f(x) = \frac{1}{x}$



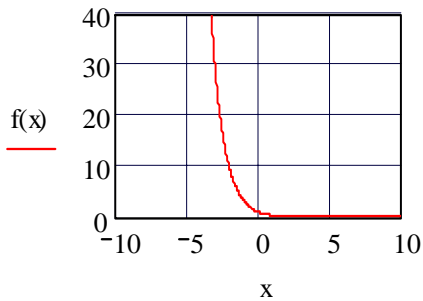
Exponential Growth Function

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

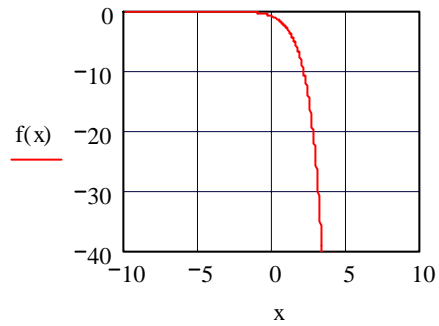


Exponential Decay Functions

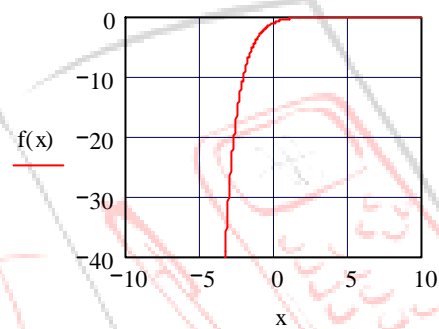
Equation: $f(x) = 3^{-x}$



Equation: $f(x) = -(3^x)$

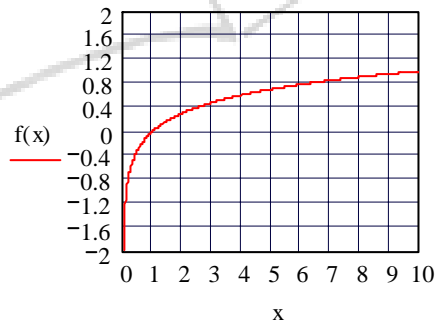


Equation: $f(x) = -(3^{-x})$

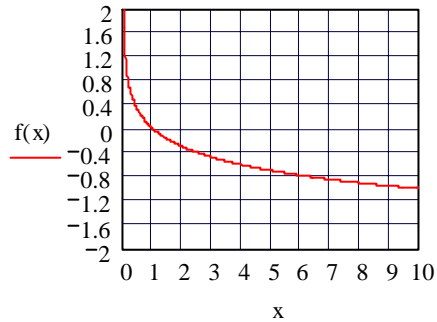


Logarithmic Functions

Equation: $f(x) = \log(x)$

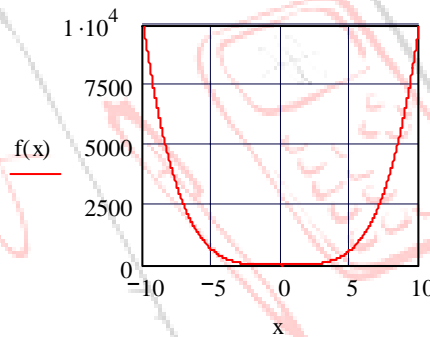


Equation: $f(x) = -\log(x)$



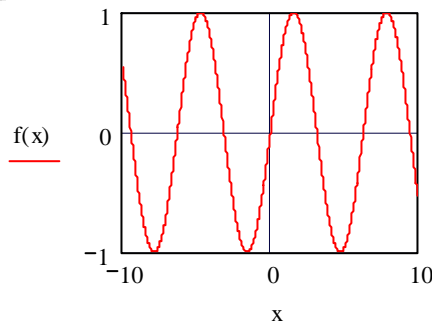
4th Degree Function

Equation: $f(x) = x^4$

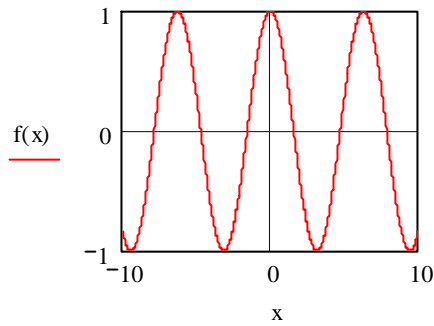


Trigonometric Functions

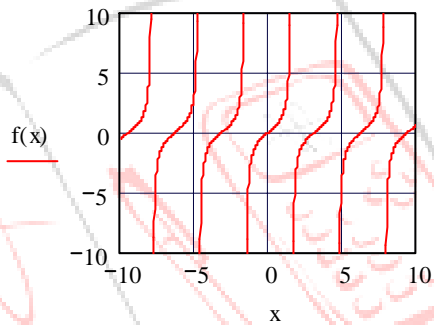
Equation: $f(x) = \sin(x)$



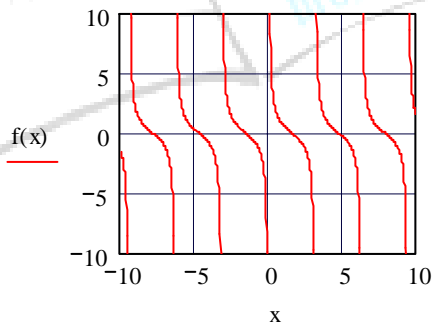
Equation: $f(x) = \cos(x)$



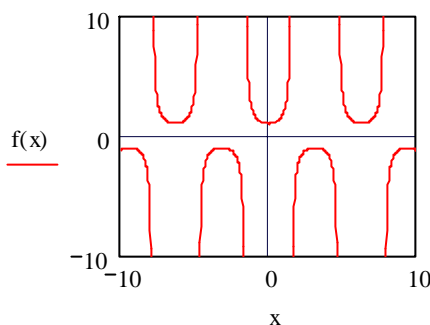
Equation: $f(x) = \tan(x)$



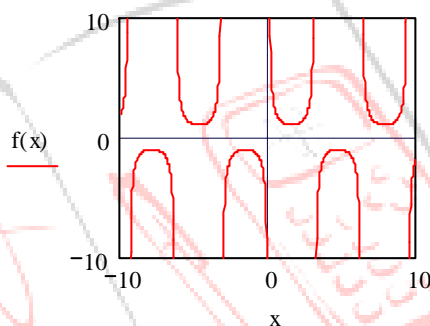
Equation: $f(x) = \cot(x)$



Equation: $f(x) = \sec(x)$



Equation: $f(x) = \csc(x)$



Shifting Properties for Graphing

		Horizontal Shift		Vertical Shift	
Reference function	Given Function	$a > 0$	$a < 0$	$b > 0$	$b < 0$
$f(x)$	$f(x+a)$	LEFT	RIGHT	XXX	XXX
$f(x)$	$f(x) + b$	XXX	XXX	UP	DOWN
$f(x)$	$f(x+a)+b$	LEFT	RIGHT	UP	DOWN
a and b are constants					