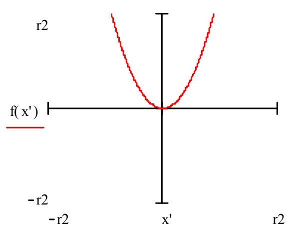
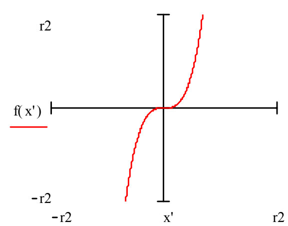
MATH 100
DR. MCLOUGHLIN'S HANDY DANDY SYSTEMATIC GRAPHING GUIDE
PART I

Let $k \in \mathbb{N}$.   Remember the basic graphs one should know:

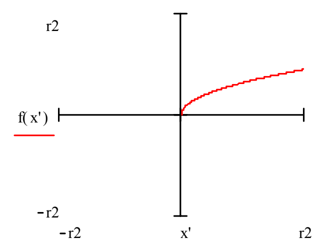
$y = x^k \ni k$ is even.



$y = x^k \ni k$ is odd



$y = \sqrt[k]{x} \ni k$ is even.



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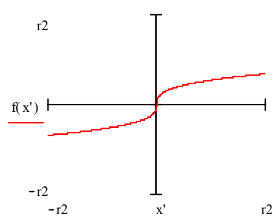
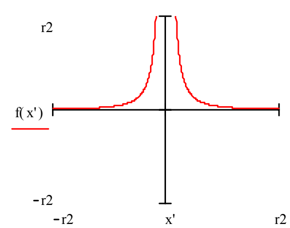


$y = x^{-k} \ni k$ is even.



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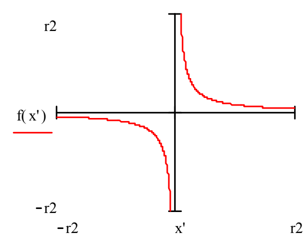
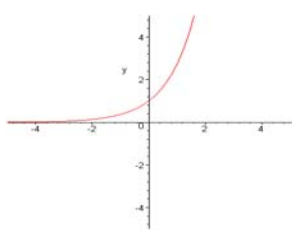
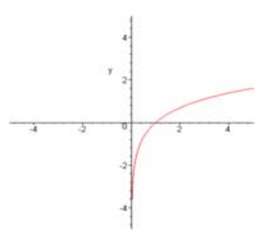


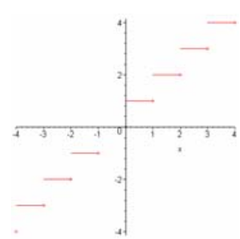
$y = \exp(x) = e^x$



$y = \ln(x)$

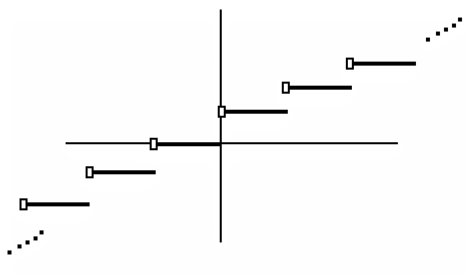


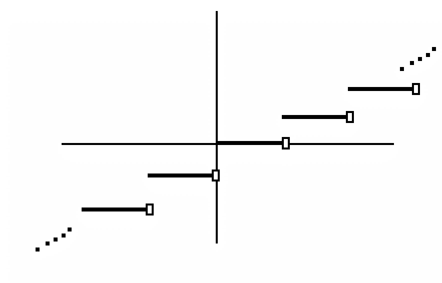
$y = \|x\| = \lceil x \rceil$



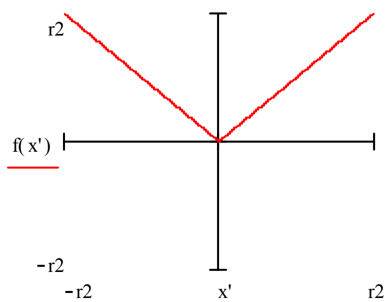
A better rendition of the ceiling and floor function is as follows:

$y = \lceil x \rceil$ $y = \lfloor x \rfloor$



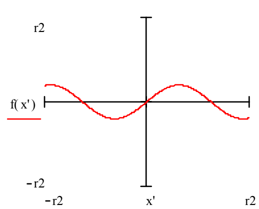


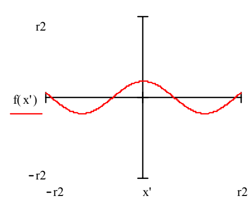
$y = | x |$.



For Math 120 you will also consider

$y = \sin(x)$ $y = \cos(x)$

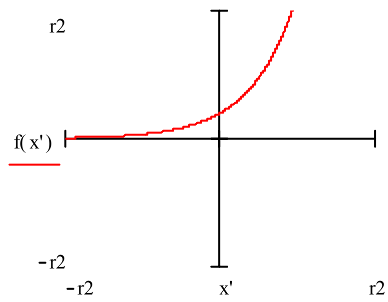




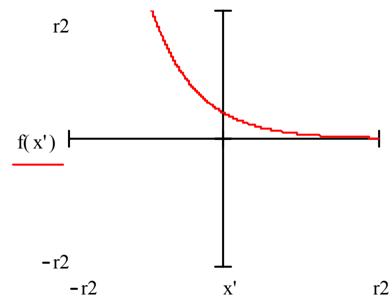
and the other trigonometric functions.

Let $z \in \mathbb{R}$. Review of other basic graphs one should know:

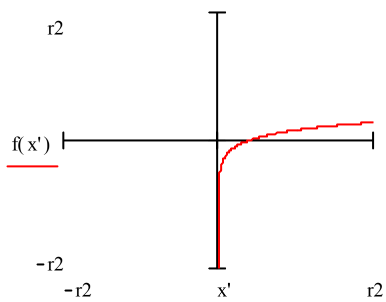
$y = z^x \ni z > 1$.



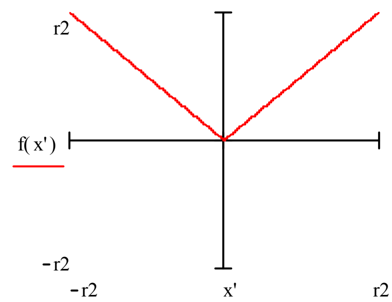
$y = z^x \ni 0 < z < 1$.



$y = \log_z(x) \ni z > 1$.



$y = | x |$.



Review of basic graphing techniques.

Let A $\in \mathbb{R}$, B $\in \mathbb{R}$, C $\in \mathbb{R}$, D $\in \mathbb{R}$,

$$y = A\,f(B(x - C)) + D$$

A stretches or contracts and flips along the y – axis

B stretches or contracts and flips along the x – axis

C shifts left or right along the x – axis

D shifts down or up along the y – axis

Consider f(x) to be a function in <u>simplified</u> form (in most situations we shall be considering a function of the form $f(x) = \dfrac{g(x)}{h(x)}$ where g(x) is a polynomial and h(x) is a polynomial).

Find where *f(x)* is above or below the x - axis.

Set the numerator of f(x) = 0 yielding first coordinates of x – intercepts;
set the denominator of f(x) = 0 yielding vertical asymptotes.

Call these values *cut values.*

Do a Positive - negative Analysis of f(x) with the cut values.

If $f(x) > 0$, then the graph is above the x -axis for all values between the cut values.
If $f(x) < 0$, then the graph is below the x -axis for all values between the cut values.

Plug each cut value back into f(x). If it exists, it is the second coordinate of the x - intercept, if it does not exist, then that cut value should have been the x - value of a vertical asymptote (or if you did not simplify the function, it could be a hole in the graph).

Also consider for rational functions the possiblilty that there are horizontal or oblique asymptotes by doing a division of the denominator of the function into the numerator of the function. If the resulting quotient is a constant, say C, then y = C is the horizontal asymptote; whereas, if the resulting quotient is of the form Ax + B where A and B are constants, then the line y = Ax + B is an oblique asymptote.