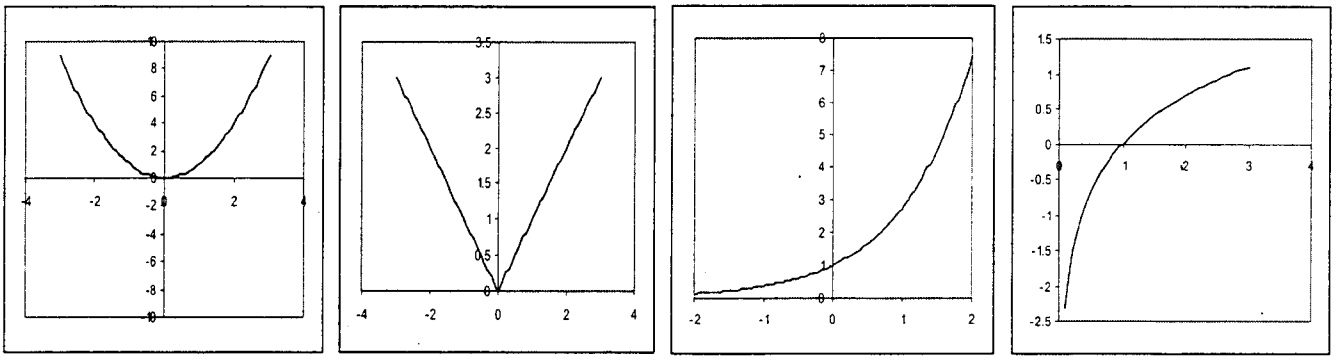
Graphing Functions

The following functions can all be graphed by plotting points from a table; however, the techniques of translations can make graphing much easier. First, let's look at four basic graphs:

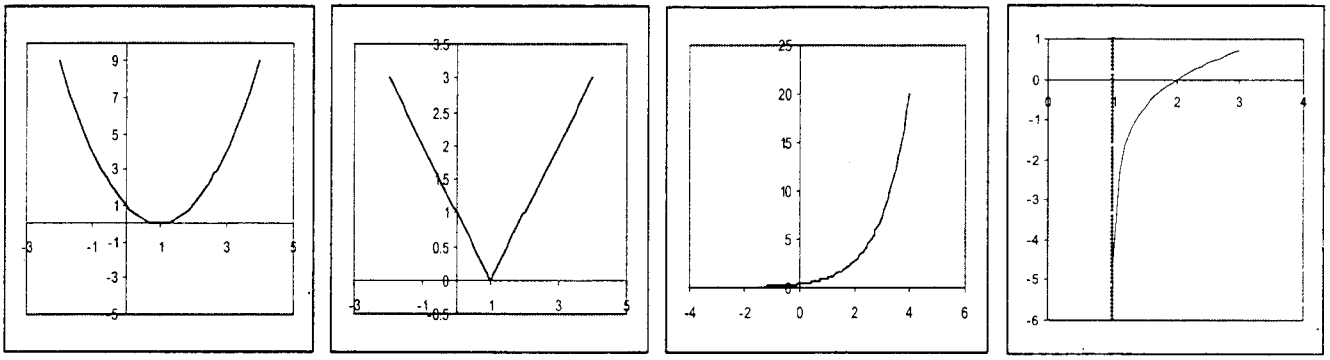
$y=x^2$ $y=|x|$ $y=e^x$ $y=\ln(x)$



Horizontal Shifts

We recognize horizontal shifts by examining the "inside" what identifies each function type. *Note* The sign "inside" is opposite the direction we move the graph- that is, a minus sign moves the graph right, and a plus sign moves it left. Also note that any vertical asymptotes will move as well (as in logarithms, etc)

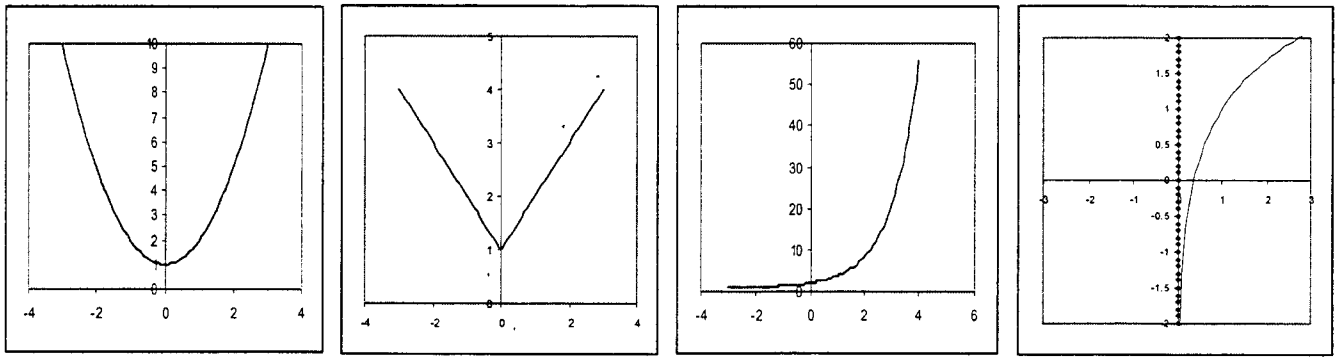
$y=(x-1)^2$ $y=|x-1|$ $y=e^{x-1}$ $y=\ln(x-1)$



Vertical Shifts

For all these functions, a vertical shift takes place when there is a constant added to or subtracted from the function. For vertical shifts, any horizontal asymptotes will move.

$y=x^2+1$ $y=|x|+1$ $y=e^x+1$ $y=\ln(x)+1$

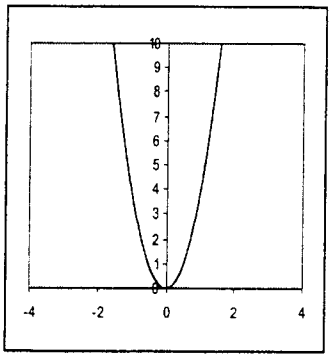


Graphing Functions

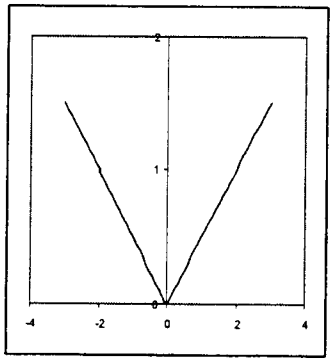
Stretching and Squeezing

If the coefficient of x is greater than 1, the function is squeezed, and grows more rapidly. If it is less than 1, it is stretched, and grows more slowly.

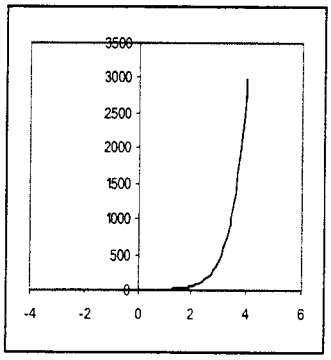
$y=2x^2$



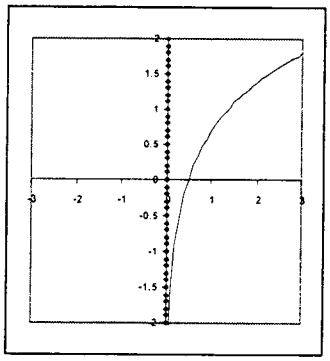
$y=|1/2x|$



$y=e^{2x}$



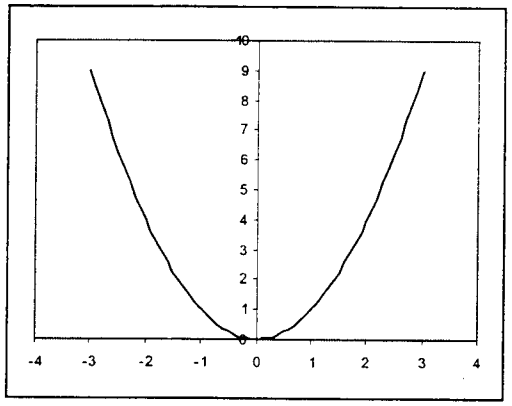
$y=\ln(2x)$



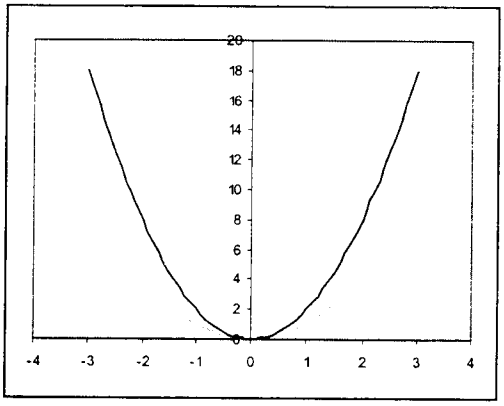
Combining these techniques

Often, our graphs are combinations of these, with horizontal and vertical translations. As an example, lets look at $y = 2(x-1)^2 - 4$. We start with the original graph, and add on one change at a time. The order does not matter; the result should be the same.

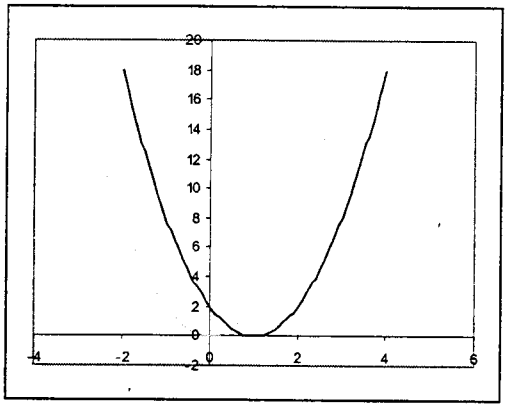
$y=x^2$



$y=2x^2$



$y=2(x-1)^2$



$y=2(x-1)^2-4$