Let's go through many examples of creating equations in LaTeX. In order to display equations in LaTeX, we put the equation stuff between a pair of "begin{equation}" and "end{equation}" statements, like this:

$$y = x^{2x-34} \tag{1}$$

Note the number to the right of the equations; that comes by default. It's possible to make equations without the number if you really want to do so.

How about an equation with a square root sign? We use curly brackets to collect symbols into groups. Note the difference between the following two examples:

$$v = \sqrt{2gH} \tag{2}$$

$$v = \sqrt{2}gH \tag{3}$$

You can add your own parentheses if you want to make it very clear to the reader how the symbols ought to be grouped:

$$v = \sqrt{2}(gH) \tag{4}$$

If you want to express quantities as fractions, you can use the "over" command inside the equation text to separate the stuff on the top from the stuff on the bottom. Note how important it is to place symbols into the proper groups: the first example looks okay in the LaTeX source, but turns into a big mistake when it is formatted. The second example uses an extra set of curly brackets to make sure that all the stuff on the right-hand-side of the equation actually does remain to the right-hand side of the equals sign.

$$\frac{x = -b \pm \sqrt{b^2 - 4ac}}{2a} \tag{5}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \tag{6}$$

$$y = A_2 x \tag{7}$$

Superscripts and subscripts are pretty easy to create: use the carat symbol for superscripts, and the underscore symbol for subscripts. If you want to put several symbols together in the superscript or subscript, use curly brackets to mark them as a group.

$$V(t) = V_0 e^- t/\tau \tag{8}$$

$$V(t) = V_0 e^{-t/\tau} \tag{9}$$

$$\frac{d^2x}{dt^2} = \tag{10}$$