Here are some examples of various equations and equation environments in LaTeX. Look them over and see how they work.

Here are some basic examples:

$$a_0 = \frac{F}{m} = \frac{P_0 A}{m} \tag{1}$$

Note the difference between equation and equation*:

$$P_0 A t = m \left(1 + \frac{\rho x A}{m}\right) v$$

Equation array (eqnarray) lets you align equations. Here are some examples of eqnarray, numbered and unnumbered.

$$\begin{aligned}
P_0(x) &= 1 \\
P_1(x) &= x \\
P_2(x) &= \frac{1}{2}(3x^2 - 1) \\
P_3(x) &= \frac{1}{2}(5x^3 - 3x) \\
P_4(x) &= \frac{1}{8}(35x^4 - 30x^2 + 3) \\
&\vdots \\
P_l(x) &= \frac{1}{2^l l!}\left(\frac{d}{dx}\right)^l (x^2 - 1)^l
\end{aligned}$$

$$\begin{aligned}
V &= \frac{2\pi R^3}{3}\int_0^\pi [1+\delta]^3 P_0^3 \sin\theta \, d\theta && (2) \\
&\approx \frac{2\pi R^3}{3}[1+3\delta]\int_0^\pi P_0 P_0 \sin\theta \, d\theta && (3) \\
&= \frac{4\pi R^3}{3}[1+3\delta] && (4)
\end{aligned}$$

`\[` and `\]` are shortcuts for `\begin{equation*}` and `\end{equation*}`.

$$x(t) = \lambda\left[\sqrt{1 + \frac{a_0 t^2}{\lambda}} - 1\right]$$

`$$` does the same thing,

$$v(t) = v_{\max}\left(1 + \frac{\lambda}{a_0 t^2}\right)^{-1/2}$$

but $ creates an inline equation such as $v = \frac{\partial x}{\partial t}$.