Some Standard LaTeX for Math.

1. standard packages

```
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{amsthm}
\usepackage{amssymb}
\usepackage[margin=1in]{geometry} (in this example I'm setting margin width)
```

2. You make displayed equations in latex by writing `\[ \sum_{n=1}^\infty \frac{1}{2^n}\]`

$$\sum_{n=1}^{\infty} \frac{1}{2^n}$$

Another example using `\[\int_0^1 x\, dx\]`

$$\int_0^1 x\, dx$$

3. There is a proof environment.

```
\begin{proof}
 Here is some math, note that $a\in A$ and $a\in B$ therefore $a\in A\cap B$.
 \end{proof}
```

Proof. Here is some math, note that $a \in A$ and $a \in B$ therefore $a \in A \cap B$. □

4. There are theorem environments.

```
\begin{theorem}
If $T$ is a right triangle of side lengths $a,b,$ and $c$, then $a^2+b^2=c^2$.
 \end{theorem}
```

Theorem 0.1. *If T is a right triangle of side lengths $a, b,$ and c, then $a^2 + b^2 = c^2$.*

5. There are definition environments.

```
\begin{definition}
$A$ is a subset of $B$ if $a\in A$ implies $a\in B$.
 \end{definition}
```

Definition 0.2. A is a subset of B if $a \in A$ implies $a \in B$.

6. common symbols

`$\alpha, \beta, \gamma, \delta,\pi$` gives the symbols $\alpha, \beta, \gamma, \delta, \pi$

`$\Gamma, \Delta,\Sigma$` gives the symbols Γ, Δ, Σ

`$\mathbb{F}$` gives the symbol $\mathbb{F}$.

`$\mathcal{A}$` gives the symbol $\mathcal{A}$.

`$f:X\rightarrow Y$` gives the symbols $f : X \to Y$.

`$\frac{1}{2}$` gives you the fraction $\frac{1}{2}$.

`$x^{2p+1}$` is how you make exponentials like x^{2p+1}

`$x_{n+1}$` is how you make subscripts like x_{n+1}

`$\sqrt[3]{x}$` is how you make roots like $\sqrt[3]{x}$

`$a+b$` gives the symbols $a + b$

`$a\cdot b$` gives the symbols $a \cdot b$

`$\forall$` gives the symbol $\forall$ (use sparingly)

`$\exists$` gives the symbol $\exists$ (use sparingly)

`$\geq$` gives the symbol $\geq$

`$\leq$` gives the symbol $\leq$

`$\neq$` gives the symbol $\neq$

`$\subseteq$` gives the symbol $\subseteq$

`$\supseteq$` gives the symbol $\supseteq$

`$\subset$` gives the symbol $\subset$

`$\supset$` gives the symbol $\supset$

`$\subsetneq$` gives the symbol $\subsetneq$

`$\supsetneq$` gives the symbol $\supsetneq$

`$A\setminus B$` gives the symbols $A \setminus B$

`$A\cap B$` gives the symbols $A \cap B$

`$A\cup B$` gives the symbols $A \cup B$

`$a\in A$` gives the symbols $a \in A$

`$A\oplus B$` gives the symbols $A \oplus B$

`$\begin{bmatrix} 1 & 2 \\ 3 & 4\end{bmatrix}$` gives you a matrix like $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

Tips on writing proofs.

1. Always remember that a proof is an argument meant to convince the reader the result is true.
2. Proofs follow the standard rules of the language in which they are written. This means you should use proper punctuation and sentence structure.
3. In english, you use the royal we when writing a proof e.g."We see by equation (13) that..."
4. Revise your proofs as you would any paper you write in college.
5. Give objects names so that you can refer to them. For example, let a be an arbitrary element in A.
6. It is best to strike a balance between too wordy and too terse. You want the argument to be clear but not so wordy it obstructs your point.
7. Learn to negate statements.
8. Be aware of your standard proof techniques: proof by induction, proof by contradiction and proof by contrapositive.
9. To disprove a statement a counter example often is enough.
10. In general, examples do not make a proof.
11. To show P if and only if Q, you show P implies Q and Q implies P.
12. Remember writing a *good* proof is difficult for everyone.