15-451 Assignment 2

Karan Sikka
ksikka@cmu.edu
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1: Mathematical Symbols

This is an example of an answer to a homework question. In your answer, you may want to use a variety of mathematical symbols:

- Fractions: $\frac{2}{3}$
- Binomial coefficients: $\binom{n}{k} = 10$
- Subscripts and superscripts: t_0, t^2, $t_0^{2/3}$,
- Greek letters: α, β, γ, λ, Π, π.
- Summations: $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$.

You can refer to Leslie Lamport's "LaTeX User's Guide and Reference Manual" for more useful info on mathematical typesetting with LaTeX. Pages 42-46 outline many of the useful math symbols and functions.

Another good reference for the mathematical symbols of LaTeX is "Inessential LaTeX" by the MIT SIPB group. Find it on the Web at `http://www.mit.edu/afs/sipb/project/doc/latex/guide.PS`

2: Little Gauss's Formula

This is another example of a question. In this case, it's a multi-part question.

(a) Recall *Little Gauss's formula*:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} \tag{1}$$

(b) Now, equation **??** can be proven by induction as follows:

- **Base case**: $n = 1$: $1 = 1(2)/2 = 1$.
- **Inductive hypothesis**: assume the equation holds for $n = 2...k$.
- **Inductive step**: for $n = k + 1$, we have

$$\sum_{i=1}^{k+1} i = (k+1) + \sum_{i=1}^{k} i$$

Using the inductive hypothesis, we can substitute for the second term on the righthand side:

$$\begin{aligned}
\sum_{i=1}^{k+1} i &= (k+1) + k(k+1)/2 \\
&= \frac{2k+2+k(k+1)}{2} \\
&= \frac{k^2+3k+2}{2} \\
&= \frac{(k+1)(k+2)}{2}
\end{aligned}$$

Lo and behold! The last line shows that for $n = k+1$, little Gauss' formula still holds for $n = k+1$! We've showed that the formula holds for $n = 1$, and we've shown that if it holds for $n = k$ it must hold for $n = k+1$. Therefore, it must hold for all n.