Make Paper

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This repository provides a template for creating personal manuscripts and notes in LaTeX. This makes it easier to compile well-formatted notes and to prepare papers for journal submission. The basic template uses ACM's Master Article Template for formatting rules.

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woot-woot

2 FORMULA'S WITH π

The first formula for π I encountered used the Taylor expansion of the arctan function evaluated at $\frac{\pi}{4}$:

$$\pi = 4 \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1}. \tag{1}$$

Not long after that encounter, I came across the Basel series which is even more surprising:

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}. \tag{2}$$

To me, the only *unsuprising* thing about the Basel series is that Euler figured it out (in the first half of the eighteenth century at that). Although proving (1) is relatively straightforward after some exposure to calculus, it wasn't until I took a course in complex variables that I learned the technology needed to give a proof of (2). Note that there are other ways to prove (2), this is just a demonstration of the way I first learned how to prove it.

If you let $C(z) = \pi \cot \pi z$ and put $f(z) = \frac{1}{z^2}$, then you can show that

$$\int_{\gamma_k} f(z)C(z)dz \to 0 \tag{3}$$

in the limit as $k \to \infty$, where $k \in \mathbb{N}$ and the curve γ_k is a square with vertices at $\pm(k + \frac{1}{2}) \pm i(k + \frac{1}{2})$. Applying the Residue Theorem then gives you (2).