Examples: Theta Functions

John D Mangual

I found some theta-functions that I like[1]:

$$8 \times \left[\left(\frac{\theta_2(\tau, z)}{\theta_2(\tau, 0)} \right)^2 + \left(\frac{\theta_3(\tau, z)}{\theta_3(\tau, 0)} \right)^2 + \left(\frac{\theta_4(\tau, z)}{\theta_4(\tau, 0)} \right)^2 \right]$$

I found it very interesting to read this formula is an "entropy" – and we might ask what it is counting.

Unfortunately the other formulas were hard to read. Theta functions are known to exhibit a very rich collection of symmetries.

[1] I don't know anything about:

- black hole microstate counting
- K3 surfaces
- $\frac{1}{4}$-BPS state counting
- Motivic Donaldson-Thomas invariants
- elliptic genera

So I won't say much about them here.

References

(1) Shamit Kachru, Arnav Tripathy **The Hodge-elliptic genus, spinning BPS states, and black holes** arXiv:1609.02158

(2) Miranda C.N. Cheng, Erik P. Verlinde. **Wall crossing, discrete attractor flow and Borcherds algebra.** arXiv:0806.2337

(3) S. Kharchev, A. Zabrodin **Theta vocabulary I** arXiv:1502.04603