

3d TFT  $\subset$  QFT: 1. Fields  $\Psi(x)$ , sections of a bundle on  $M$ , or maps  $M \rightarrow X$ .

2. Action  $S = \int d^n x \mathcal{L}(\Psi)$

3.  $Z_\omega = \int [\mathcal{D}\Psi] e^{-S\Theta(\Psi)}$

Atiyah's Axioms: Closed 3D  $M \xrightarrow{\text{TFT}} \text{Complex } \# = Z(M)$

closed 2D  $N \rightarrow \text{v.s. } Z(N)$

$Z(\bar{N}) = Z(N)^*$ ,  $Z(N_1 \cup N_2) = Z(N_1) \otimes Z(N_2)$

$Z(\emptyset) = \mathbb{C}$

$\partial M = N \Rightarrow Z(M) \in Z(N)$  w/ some composition laws.

Extended TFT:

$P = S^1 \mapsto \text{a category}$

$N$  has bndry

$Z(N) = \text{object of } Z(P)$

$Z(\bar{P}) = \text{dual category (functors into v.s.)}$

$N = N_1 \cup N_2$



$Z(N) = Z(N_2)$  evaluated on  $Z(N_1)$

0-dim should go to a 2-category.

Is it that mathematicians don't know how to listen to physicists, or that physicists have evolved a culture that de-emphasises communication?

I.e. is it that math & physics don't communicate well, or that physicists don't communicate well even among each other?