Hi! So you have to talk about the ... The [illegible] is a technique [illegible] used to EXTRACT INFO about a class of QFTs called CFTs, What's cool, non-pert, w/out $\mathcal{L}$ or Feynman

First, we need to talk about CFTs

A CFT is a QFT w/ no [illegible] intrinsic length scale → Physics unchanged under angle pres. trans. — DON'T LIST

$$\phi'(x') = \left|\frac{\partial x'}{\partial x}\right|^{-\Delta/d} \phi(x)$$

(Eg $x \to \lambda x$, $\phi \to \lambda^{-\Delta}\phi$)

$x_{12} \equiv |\vec{x}_1 - \vec{x}_2|$

$$\langle \phi_i(\vec{x}_1)\, \phi_j(\vec{x}_2) \rangle = \frac{C_{ij}}{x_{12}^{\Delta_i+\Delta_j}} = \frac{\delta_{ij}}{x_{12}^{2\Delta_i}}$$

→ Mention SETs here

$$\langle \phi_i(\vec{x}_1)\, \phi_j(\vec{x}_2)\, \phi_k(\vec{x}_3) \rangle = \frac{C_{ijk}}{x_{12}^a\, x_{23}^b\, x_{31}^c}$$

$a = \Delta_i + \Delta_j - \Delta_k$ ...

→ CFT DATA ↓ All combs valid?

Consistency Conds. —(1980s: D=2; 2008–Now, D≥3)→ CFT DATA —1980s→ All ⟨...⟩

Idea

7MINS

10:52

$$U = \frac{x_{12}^2\, x_{34}^2}{x_{13}^2\, x_{24}^2}, \quad V = \frac{x_{23}^2\, x_{14}^2}{x_{13}^2\, x_{24}^2}$$

↳ 4pt not easy

Wave hands, OPE → As it turns out, all fields which pop up are prim or desc.

But, OPE of which? $\langle \phi(x_1)\phi(x_2)\phi(x_3)\phi(x_4)\rangle = \frac{\sum_{\mathcal{O}\in\phi\times\phi} C^2_{\phi\phi\mathcal{O}}\, g_{\Delta,\ell}(u,v)}{x_{12}^{2\Delta_\phi}\, x_{34}^{2\Delta_\phi}}$

SMOKE

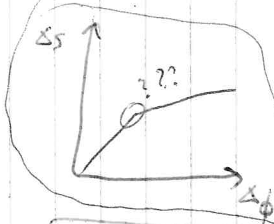
$$\hookrightarrow \sum_{\mathcal{O}\in\phi\times\phi} C^2_{\phi\phi\mathcal{O}} \left[v^{\Delta_\phi} g_{\Delta,\ell}(u,v) - u^{\Delta_\phi} g_{\Delta,\ell}(v,u) \right] = 0$$

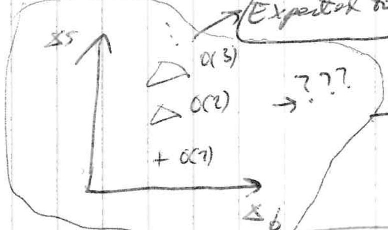
↳ ~ EOM

(1) Guess which Δ, ℓ appear

(2) [Make a vector] → Eg (1D), 2D.

(3) Get Contradiction?





Expected to shrink to a point

→ ??? → More ⟨...⟩ & mixed

Why this is cool (DEFINING a QFT)

- No $\mathcal{L}$, no Feynman diagrams
- Imposed consistency on the theory
- Mapping the space of poss. QFTs

What I didn't say

- Unitarity, spin, raising/lowering ops,
- Exact solns in 2D. ← States ↔ op
- Properties of $T_{\mu\nu}$

Further Work

- Why the kink?
- Other [illegible]?
- Other conditions, other CFTs
- Better numerics.

Hope I convinced you that this is an interesting topic of modern research, thank you all for listening