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PhD: SISSA 2021 (Tamara Grava, Marco Bertola)

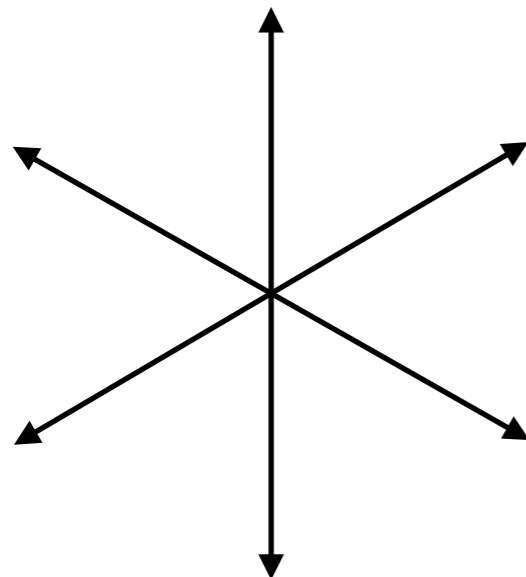
Thesis: Painlevé tau-functions and Fredholm determinants

General philosophy

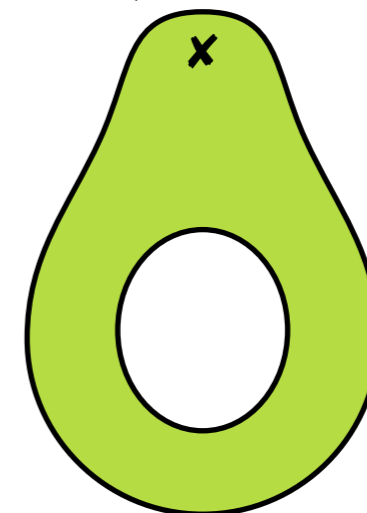
1. Solutions of Painlevé equations = $d \log(\text{Fredholm determinant}) + \dots$
2. Minor expansion of Fredholm determinant = Conformal blocks

Cafasso,
Gavrylenko,
Lisovyy 2016,17:
PVI, V, III

Painlevé II:
(H.D'19, H.D'20) $\frac{d^2u(x)}{dx^2} = 2u(x)^3 + xu(x)$



Special form of
elliptic Painlevé VI : $\frac{d^2Q(\tau)}{d\tau^2} = m^2 \wp(2Q(\tau) | \tau)$
(1pt-torus)
(Del Monte- H.D- Gavrylenko'20)



The big picture...

Nekrasov-Okounkov functions:

$$\epsilon_1 + \epsilon_2 = 0$$

$$\epsilon_1 + \epsilon_2$$

$$\epsilon_1 = 0, \text{ arb. } \epsilon_2$$

Conformal Field Theories (CFTs):

$$c = 1$$

$$\text{arb. } c$$

$$c \rightarrow \infty$$

1pt-torus \leftrightarrow III, V, VI

?

1pt-torus \leftrightarrow III₃

Integrable systems:

Painlevé equations

Quantum Painlevé equations

Heun type equations

Random matrices:

$$\beta = 2$$

$$\beta$$

$$\beta \rightarrow \infty$$

Gaussian Multiplicative Chaos (GMC)

R. Chhaibi's talk on Aug 24

Work in progress:

1. Conformal block representation of the remaining Painlevé equations?
2. In the case of 1pt-torus, can we associate probabilistic conformal blocks to some quantum integrable system?