FACULTY
OF MATHEMATICS
AND PHYSICS
Charles University

Part 2 - Classical black hole thermodynamics: List of Exam Questions

I will ask you 1-2 questions from the following set.

1 List of questions

1) Estimate a lifetime of a black hole until it completely evaporates by Hawking radiation. Why does this effect potentially give rise to the black hole information paradox?

2) By using the Euclidean trick, derive the temperature of a Schwarzschild black hole (dS space, Rindler,...). Are there any peculiarities when it comes to the associated thermodynamic properties when compared to the standard everyday thermodynamic systems?

3) Discuss gravitational action and its role for black hole thermodynamics. Comment on the difference between Gibbons–Hawking and Brown–York approaches.

4) Summarize basic properties of black hole entropy. What kind of entropy is this?

5) Why should we study AdS black holes? Describe 'advantages' over their asymptotically flat cousins.

6) Discuss Smarr relation for AdS black holes and how it is connected to variable cosmological constant.

7) Discuss Hawking-Page and van der Waals-like phase transitions of AdS black holes.