

# Numerical Relativity 2022-2023

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## Homework 1 (March 24 2023)

1. **[max 2 pages]** Explain what weakly and strongly hyperbolic systems are and why it is important to write hyperbolic equations in a strongly hyperbolic form.
2. **[max 2 pages]** Briefly describe the  $3+1$  formulation of Einstein's equations and explain the meaning of the lapse function and shift vector.
3. **[max 2 pages]** Briefly describe the ADM and BSSN equations and how we derived them.

Figures do not count toward the maximum number of page limit. Use an A4 page format and a font size of at least 11.

**Note: in order to get admitted to the oral exam you are requested to submit the answers to all these questions as a single pdf document via email at least two weeks before the oral exam.**