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Vacuum Spacetimes

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Abstract: This is a exploratory effort in understanding vacuum spacetimes from all aspects - analytical, numerical, geometrical - so that one can prepare oneself to understand the higher truths in the phenomenological and experimental results of such spacetimes.

The main references are expected to be books on General Relativity by Prof. T Padmanabhan and Prof. Sean Carroll, and the book on Numerical Relativity by Prof. Baumgarte and Prof. Shapiro. If the occasion demands, we might also refer to Prof. Maggiore's two tomes on Gravitational Waves.

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1 (Not) A Lightning Fast Review of General Relativity

Physicists are in search of equations that do not change form in any coordinate system, and hence are universal. We write all our non-relativistic laws in form of vector equations. In relativity, we shall write all our laws in form of *four vectors* and related quantities. An important object which usually appears in such equations is called the *tensor*.

1.1 Tensors

1.1.1 Tensor LOLs