



C7.5: General Relativity I Introduction

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Administrative information

- Full lecture notes are available at <https://courses.maths.ox.ac.uk/node/49659> (send me comments/corrections!).
- Example sheet 0 available at <https://courses.maths.ox.ac.uk/node/49658>.
- Other example sheets are available but may be updated slightly.
- Lectures will go up as soon as they are ready...
- There will be 2 or 3 special lectures going through example calculations in depth.
- “Office hours” on Teams on Wednesday afternoons.

Course overview

- Introduction: what is *spacetime*?
- Brief review of Newtonian gravity:
- Special relativity from a geometric point of view.
- Differential geometry:
- The Einstein equations.
- The Schwarzschild solution:
- Cosmology:

Course overview

- Introduction: what is *spacetime*?
- Brief review of Newtonian gravity:
 - What are its problems?
 - The *equivalence principle*.
- Special relativity from a geometric point of view.
- Differential geometry:
- The Einstein equations.
- The Schwarzschild solution:
- Cosmology:

Course overview

- Introduction: what is *spacetime*?
- Brief review of Newtonian gravity:
- Special relativity from a geometric point of view.
- Differential geometry:
 - Manifolds, vectors and tensors.
 - Calculus on manifolds; connections.
 - Geodesics.
 - Curvature.
- The Einstein equations.
- The Schwarzschild solution:
- Cosmology:

Course overview

- Introduction: what is *spacetime*?
- Brief review of Newtonian gravity:
- Special relativity from a geometric point of view.
- Differential geometry:
- The Einstein equations.
- The Schwarzschild solution:
 - Solar system GR effects: bending of light, perihelion precession.
 - Black holes, event horizons and singularities.
- Cosmology:

Course overview

- Introduction: what is *spacetime*?
- Brief review of Newtonian gravity:
- Special relativity from a geometric point of view.
- Differential geometry:
- The Einstein equations.
- The Schwarzschild solution:
- Cosmology:
 - Cosmological redshift and expansion of the universe.
 - The big bang.