Manifolds, Tensor Analysis

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Origami

1. Curves in 2D
2. Curves in 3 D, Surfaces Intro
3. Ruled and developable Surfaces
4. Tensor Analysis Intro Developable Surfaces
5. Vid Metric and Curvature of Parametric Surfaces in 3D
6. Principle Curvature Directions, Application Origami
7. Curvature conditions Curved Folds
8. Dynamics of a circular crease fold

Manifolds

1. Intro to Manifolds Definitions Vectors Charts
2. Defining Vectors
3. Vector Spaces, Basis, Components.
4. Curves, Tangent Vectors, Displacements
5. Introduction to Binary Pulsar J0737 as a laboratory for testing General Relativity
6. Dual Space Tensors, Integral Curves
7. Tensor operations and representation
8. Smooth Tensor Fields, Transformation Laws Metric
9. Parabolic coordinates Example. Abstract index notation, tensor manipulations
10. Parallel Transport, Derivative Operators
11. Connection. Derivative Consistent with metric. Example Parallel transport.
12. Curvature
13. A. Curvature Properties

    B. Curvature and Geodesics Example of geodesics on a sphere
14. Properties and uses of geodesics.

Extra Background

1. ManiFolds Derivation of Euler Lagrange Equations

GR Tests

1. Derivation of Geodesic equations for an arbitrary black hole using the Hamiltonian Formalism.
2. Hamiltonian Dynamics Cyclic Coordinates
3. Hamiltonian Dynamics Canonical Transformations
4. Hamiltonian Dynamics Generation Functions A B
5. Carlsons Integrals

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