

Demonstration 2 (israel): Reduction of Ricci to zero, calculation and simplification of the Kretschmann scalar in Israel coordinates.

> **restart:**

> **grtw();**

GRTensorII Version 1.79 (R6)

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Developed by Peter Musgrave, Denis Pollney and Kayll Lake

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e:/Grtii(6)/Metrics

> **qload(israel);**

Default spacetime = israel

For the israel spacetime:

Coordinates

x(up)

$x^a = [u, w, \theta, \phi]$

Line element

$$ds^2 = \frac{1}{2} \frac{w^2}{m r(u, w)} du^2 + 2 du dw + r(u, w)^2 d\theta^2 + r(u, w)^2 \sin(\theta)^2 d\phi^2$$

$$\text{Constraints} = \left[r(u, w) = 2m + \frac{\frac{1}{4}uw}{m} \right]$$

Israel coordinates (Phys. Rev. 143,1016)

> **grcalc(R(dn,dn),RiemSq);**

Created definition for R(dn,dn,up,up)

CPU Time = .180

> **gralter(_,13);**

Component simplification of a GRTensorII object:

Applying routine `Apply constraints repeatedly` to object R(dn,dn)

Applying routine `Apply constraints repeatedly` to object RiemSq

CPU Time = .020

> **grdisplay(_);**

For the israel spacetime:

Covariant Ricci

R(dn, dn)

$R_{a b} = \text{All components are zero}$

Full Contraction of Riemann

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[>

$$K = 196608 \frac{m^8}{(8m^2 + uw)^6}$$