

# RIEM2

Compendium to RIEMANN with some further metrics and programs

ExCoord: examples with various coordinates	<pre> RAD XYZ DEC R= 'X' CHOMF RTFM2? 7: 6: 5: 4: 3: 2: 1: Coordinates * "cylindrical coordin * "spherical coordinat * "conform compact coo * "rotating coordinate * "Rindler coordinates </pre>	<pre> RAD CHOM 7: 6: 5: 4: 3: 2: 1: Ex Metrics * "Barriola Vilenkin * "Bertotti Kasner+H * "Bessel grav. wave" * "Cosmic string Schw * "Eddington Finkelst * "Kruskal Szekeres+H * "deSitter standard * "deSitter Universe" </pre>
ExMe1: examples with further metrics	<pre> RAD CHOM 7: 6: 5: 4: 3: 2: 1: Ex Metrics * "Goedel Universe cy * "Goedel Universe co * "Jannis Newman Mini * "Kasner" { 'p1+p2+p * "Kottler+H cosmolog * "Lemaître Tolman" { * "Morris Thorne worm * "Plane Wave Rindler </pre>	<pre> RAD CHOM 7: 6: 5: 4: 3: 2: 1: Ex Metrics * "pp-Wave" 'H(u,x,y) * "Straight spinning * "McVittie" { T r 0 * "BTZ black hole+r, * "Wormhole in 3D+Hr * "Ellis Wormhole" { * "dynamic Ellis worm * "Einstein Rosen Bri </pre>
ExMe1: examples with further metrics	<pre> RAD CHOM 7: 6: 5: 4: 3: 2: 1: Ex Metrics * "Wormhole in 3D+Hr * "Ellis Wormhole" { * "dynamic Ellis worm * "Einstein Rosen Bri * "Info (Anti)deSitte * "Open de Sitter" { * "Closed de Sitter" * "Anti de Sitter" { </pre>	<pre> RAD CHOM 7: 6: 5: 4: 3: 2: 1: Ex: Black Hole Metrics * "Info on BH metrics: * "Reissner Nordstroem * "Reissner Nordstroem * "Kerr" "event horizo * "Kerr Newman" { 'x=C * "Kerr Newman 2" { 'u * "Taub NUT" "H=mass p * "Kerr Taub NUT" { '0 </pre>
ExMe1: example deSitter standard	<pre> 2: 1: -1 0 0 0 0 α²·COSH(α)² 0 0 0 α²·SINH(α)²·COSH 0 0 0 </pre>	<pre> 3: 2: 1: "Open de Sitter" - L² 0 0 L²+t² 0 0 0 t² 0 0 0 t²·SINH(α)² 0 0 0 t²·SINH(α)² </pre>
Open de Sitter	<pre> Hxd22 Ext... TOVEq SLin C+R+ d+der 4Hxd22Ext... nonrotating BH Reissner Nordstroem: nonrotating electric charged BH Taub NUT: 1911.06318 nonrotating el.+magn. charged BH Kerr: rotating BH Kerr Newman: rotating el. charged BH Kerr Taub NUT: 2010.07861 rotating el.+magn. charged BH +SKIP SKIP+ +DEL DEL+ DEL L INS = </pre>	<pre> ExMe2 Hxd22 Ext... Subst TOVEq SLin 3: 2: 1: F(r)=1- r³+Q² r² - f(r) 0 0 0 0 1 F(r) 0 0 0 0 r² 0 0 0 0 r²·SINH(α)² </pre>
ExMe2: Info on black hole (BH) metrics	<pre> 4: 3: 2: 1: { "Kerr" r=2·GM/c² a=J/H·c } { gtt(r,θ)=-(1- r²/r²) grr(r,θ)=t 3μν: [ gtt(r,θ) 0 0 0 0 grr(r,θ) 0 0 0 0 0 gθθ(r,θ) gφφ(r,θ) 0 0 0 ] </pre>	<pre> ExMe2 Hxd22 Ext... Subst TOVEq SLin 4: 3: 2: 1: "Kerr" r=2·GM/c² a=J/H·c ds²=-f(r)·(dt+2·L·COS(θ)·dφ)²+1/f(r) - f(r) 0 0 0 0 1 F(r) 0 0 0 0 r² 0 0 0 0 r²·SINH(α)² </pre>
Reissner Nordström	<pre> 4: 3: 2: 1: { "Kerr" r=2·GM/c² a=J/H·c } { gtt(r,θ)=-(1- r²/r²) grr(r,θ)=t 3μν: [ gtt(r,θ) 0 0 0 0 grr(r,θ) 0 0 0 0 0 gθθ(r,θ) gφφ(r,θ) 0 0 0 ] </pre>	<pre> ExMe2 Hxd22 Ext... Subst TOVEq SLin 4: 3: 2: 1: "Kerr" r=2·GM/c² a=J/H·c ds²=-f(r)·(dt+2·L·COS(θ)·dφ)²+1/f(r) - f(r) 0 0 0 0 1 F(r) 0 0 0 0 r² 0 0 0 0 r²·SINH(α)² </pre>
Kerr metric	<pre> 4: 3: 2: 1: { "Kerr" r=2·GM/c² a=J/H·c } { gtt(r,θ)=-(1- r²/r²) grr(r,θ)=t 3μν: [ gtt(r,θ) 0 0 0 0 grr(r,θ) 0 0 0 0 0 gθθ(r,θ) gφφ(r,θ) 0 0 0 ] </pre>	<pre> ExMe2 Hxd22 Ext... Subst TOVEq SLin 4: 3: 2: 1: "Kerr" r=2·GM/c² a=J/H·c ds²=-f(r)·(dt+2·L·COS(θ)·dφ)²+1/f(r) - f(r) 0 0 0 0 1 F(r) 0 0 0 0 r² 0 0 0 0 r²·SINH(α)² </pre>
Taub NUT metric	<pre> 4: 3: 2: 1: { "Kerr" r=2·GM/c² a=J/H·c } { gtt(r,θ)=-(1- r²/r²) grr(r,θ)=t 3μν: [ gtt(r,θ) 0 0 0 0 grr(r,θ) 0 0 0 0 0 gθθ(r,θ) gφφ(r,θ) 0 0 0 ] </pre>	<pre> ExMe2 Hxd22 Ext... Subst TOVEq SLin 4: 3: 2: 1: "Kerr" r=2·GM/c² a=J/H·c ds²=-f(r)·(dt+2·L·COS(θ)·dφ)²+1/f(r) - f(r) 0 0 0 0 1 F(r) 0 0 0 0 r² 0 0 0 0 r²·SINH(α)² </pre>
Help RIEM2	<pre> RIEM2 TOOLS FOR RIEMANN METRICS FROM arXiv: 0904.4184 ExCoord + ... {x&gt;} gμν:[] ExMe1,2 + ... {x&gt;} gμν:[] EX: METRICS FOR M+Conn. THEN YOU CAN SUBSTITUTE RELATIONS WITH Subst {x&gt;} [lgμν] (ds²=...) + [lgμν] {x&gt;} {Rμν} Metric to connection +SKIP SKIP+ +DEL DEL+ DEL L INS = </pre>	<pre> ExMe2 Hxd22 Ext... Subst TOVEq SLin 4: 3: 2: 1: "Kerr" r=2·GM/c² a=J/H·c ds²=-f(r)·(dt+2·L·COS(θ)·dφ)²+1/f(r) - f(r) 0 0 0 0 1 F(r) 0 0 0 0 r² 0 0 0 0 r²·SINH(α)² </pre>

Help RIEM2	<pre> C+RiHalt g<sub>uv</sub> {x^2} {f<sub>uv</sub>} + .. g<sub>uv</sub> {x^2} {R:2} {f<sub>uv</sub>} R<sub>uv</sub> HALT AFTER EVERY SINGLE R#0. R#0 ARE THEN ADDED TO LIST {R:2} EX: CONN. OF KERR Cont + .. CONTINUE) AFTER EVERY HALT Eval {I,C2} + {I',C2'} TriHyp {I,C2} + {I'} simplify terms with SIN(CH),COS(CH) +SKIP SKIP+ +DEL DEL+ DEL L INS= </pre>	<pre> subst 0 {V1=01'..3} + 0' SUBSTITUTE VARS V1.. IN OBJECT 0 = I,{I},C2 PERFORMS d+der dM+Conn {x^2} g<sub>uv</sub>: {I} + [{g<sub>uv</sub>}] {x^2} {x^2} + {f<sub>uv</sub>} x<sup>u</sup> x<sup>v</sup> DIAGONAL METRIC TO CONN. EX: McVittie WITH M+Conn + INSUFFICIENT MEMORY Mxds2 {x^2} g<sub>uv</sub>: {I} ↔ {x^2} ds^2 ds^2= g<sub>uv</sub> dx<sup>u</sup> dx<sup>v</sup> Ext<sub>uv</sub> = + .. EXAMPLES FOR T<sub>uv</sub> +SKIP SKIP+ +DEL DEL+ DEL L INS= </pre>
Help RIEM2	<pre> Ext<sub>uv</sub> = + .. EXAMPLES FOR T<sub>uv</sub> ENERGY MOMENTUM TENSOR TOVeq = + 'eq1'.. 'eq4' TOLMANN OPPENHEIMER VOLKOV EQNS OBTAINED IN RIEMANN SLin eq + eq' SIMPLIFY eq WITH FOISTRIB, LIN FOR EACH SUMMAND, EVAL EX: TOVeq C+R<sup>2</sup><sub>uvp0</sub> {x^2}{f<sub>uvp</sub>} {x^2} x<sup>u</sup> x<sup>v</sup> x<sup>p</sup> + R<sup>2</sup><sub>uvp</sub> connection to a component of Riemann +SKIP SKIP+ +DEL DEL+ DEL L INS= </pre>	<pre> Without simplification. subprogram of CERICH C+RiHalt 'd2d1g<sub>uv</sub>(r,θ)' + '3θ(3r(g<sub>uv</sub>(r,θ)))' works for d1..d3 M+Geodes {x^2} [{g<sub>uv</sub>}] + [{g<sub>uv</sub>}] {x^2} {x^2} + {f<sub>uv</sub>} x<sup>u</sup> x<sup>v</sup> Metric to geodesic eqn. subprog of M+Conn Geo+Conn {x^2} {x^2} + {f<sub>uv</sub>} x<sup>u</sup> x<sup>v</sup> 4 + {x^2} {I} {f<sub>uv</sub>} +SKIP SKIP+ +DEL DEL+ DEL L INS= </pre>