Default spacetime = schwb
For the schwb spacetime:
Coordinates
$x^{\mu} = [r, \theta, \phi, t]$

Basis inner product
$\eta(bup, bup) = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Basis (covariant components)
$\omega_{1a} = \left[ \frac{\sqrt{r}}{\sqrt{r - 2m}}, 0, 0, 0 \right]$
$\omega_{2a} = [0, r, 0, 0]$
$\omega_{3a} = [0, 0, r \sin(\theta), 0]$
$\omega_{4a} = \left[ \frac{\sqrt{r}}{\sqrt{r - 2m}}, 0, 0, 0 \right]$

Schwarzschild basis
Created a definition for e(bdn, dn, pdn)

Component simplification of a GRTensorII object:
Applying routine simplify to object \( \text{lambda}(\text{bdn}, \text{bdn}, \text{bdn}) \)
Applying routine simplify to object \( \text{rot}(\text{bdn}, \text{bdn}, \text{bdn}) \)
Applying routine simplify to object \( \text{str}(\text{bdn}, \text{bdn}, \text{bdn}) \)

\[
CPU \ Time \ = \ .100
\]

\[
> \; \text{grdisplay}(\_);
\]

For the schwb spacetime:

pre-Rotation Coefficients

\[
\lambda_{(1)(2)} = \frac{-r + 2 \, m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
\lambda_{(1)(3)} = \frac{-r + 2 \, m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
\lambda_{(1)(4)} = \frac{m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
\lambda_{(2)(3)} = -\frac{\cos(\theta)}{r \sin(\theta)}
\]

Rotation Coefficients

\[
\gamma_{(1)(2)} = \frac{-r + 2 \, m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
\gamma_{(1)(3)} = \frac{-r + 2 \, m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
\gamma_{(1)(4)} = \frac{m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
\gamma_{(2)(3)} = -\frac{\cos(\theta)}{r \sin(\theta)}
\]

Structure Constants

\[
C_{(2)(1)(2)} = \frac{\sqrt{r - 2 \, m}}{r^{\frac{3}{2}}}
\]

\[
C_{(3)(1)(3)} = \frac{\sqrt{r - 2 \, m}}{r^{\frac{3}{2}}}
\]

\[
C_{(4)(1)(4)} = -\frac{m}{r^{\frac{3}{2}} \sqrt{r - 2 \, m}}
\]

\[
C_{(3)(2)(3)} = \frac{\cos(\theta)}{r \sin(\theta)}
\]

\[
> \; \text{grcalc}(\text{C}(\text{bup}, \text{bup}, \text{bdn}, \text{bdn}))
\]
Created definition for \( C(bup,bup,bdn,bdn) \)
Created definition for \( \text{rot}(bdn,bup,bdn) \)

\[ CPU \ Time = .220 \]

\[ \text{gralter}(\_ , 1) ; \]

Component simplification of a GRTensorII object:

Applying routine \textit{simplify} to object \( C(bup,bup,bdn,bdn) \)

\[ CPU \ Time = .010 \]

\[ \text{grdisplay}(\_); \]

\texttt{For the schwb spacetime:}

\[ C(bup,bup,bdn,bdn) \]

\[ C^{(1)(2)}_{(1)(2)} = \frac{m}{r^3} \]

\[ C^{(1)(3)}_{(1)(3)} = \frac{m}{r^3} \]

\[ C^{(1)(4)}_{(1)(4)} = -2 \frac{m}{r^3} \]

\[ C^{(2)(3)}_{(2)(3)} = -2 \frac{m}{r^3} \]

\[ C^{(2)(4)}_{(2)(4)} = \frac{m}{r^3} \]

\[ C^{(3)(4)}_{(3)(4)} = \frac{m}{r^3} \]