

22 ms

```
%1 lcs(g,c):=block(local d:=length(c),r:=table(zeros(d,d),k,1,d);
  for k from 1 to d do
    for l from 1 to d do
      for m from 1 to d do
        r[k][l][m]:=1/2*(diff(g[k][l],c[m])+diff(g[k][m],c[l])-diff(g[l][m],c[k]))
      end
    end
  end;
r);
mcs(g,c):=block(local G:=g^-1,L:=lcs(g,c); table(sum(G[k,l]*L[k],k,1,4),l,1,4));
R(g,c):=block(
  local d:=length(c),
  G:=mcs(g,c),
  R:=table(table(zeros(d,d),k,1,d),l,1,d);
  for k from 1 to d do
    for l from 1 to d do
      for m from 1 to d do
        for n from 1 to d do
          R[k][n][m][l]:=diff(G[k][l][m],c[n])-
            diff(G[k][l][n],c[m])-
            sum(G[a][l][n]*G[k][a][m],a,1,d)+
            sum(G[a][l][m]*G[k][a][n],a,1,d)
        end
      end
    end
  end;
R);
depends([A,B],r);
lg:=diagmatrix([B,-A,-r^2,-r^2*sin(theta)^2])


$$\begin{pmatrix} B & 0 & 0 & 0 \\ 0 & -A & 0 & 0 \\ 0 & 0 & -r^2 & 0 \\ 0 & 0 & 0 & -r^2 \sin^2(\theta) \end{pmatrix}$$

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<1 ms

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%2 coords:=[t,r,theta,phi]
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[t,r,θ,φ]
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328 ms

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%3 S:=simplify(sum(R(lg,coords)[k][k],k,1,4).lg^-1);
E:=simplify(S-1/2*trace(S)*identity(4))
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$$\begin{pmatrix} \frac{A^2 - A + (\frac{dA}{dr})r}{A^2 r^2} & 0 & 0 & 0 \\ 0 & -\frac{AB + B + (\frac{dB}{dr})r}{AB r^2} & 0 & 0 \\ 0 & 0 & \frac{-2AB(\frac{d^2 B}{dr^2})r + 2B^2(\frac{dA}{dr}) - 2AB(\frac{dB}{dr}) + B(\frac{dA}{dr})(\frac{dB}{dr})r + A(\frac{dB}{dr})^2 r}{4A^2 B^2 r} & 0 \\ 0 & 0 & 0 & \frac{-2AB(\frac{d^2 B}{dr^2})r + 2B^2(\frac{dA}{dr}) - 2AB(\frac{dB}{dr}) + B(\frac{dA}{dr})(\frac{dB}{dr})r + A(\frac{dB}{dr})^2 r}{4A^2 B^2 r} \end{pmatrix}$$

20 ms

```
%4 T:=solve(exp(logcombine(subst(C1=log(2*G*M),dsolve(numer(E[1,1])=0,A)),"positive")),A)
```

$$\left[A = \frac{r}{-2GM + r} \right]$$

46 ms

```
%5 densityplot(subst([G=1/(10*M),r=sqrt(x^2+y^2)],rhs(T[1])),[x,-10,10],[y,-10,10])
```

