

(%i1)

```
/* define special summation function */
f(i,j) := sum(R[i,j,sigma,0]*gContr[i,sigma]*gContr[j,0],sigma,0,3)
        + sum(R[i,j,sigma,1]*gContr[i,sigma]*gContr[j,1],sigma,0,3)
        + sum(R[i,j,sigma,2]*gContr[i,sigma]*gContr[j,2],sigma,0,3)
        + sum(R[i,j,sigma,3]*gContr[i,sigma]*gContr[j,3],sigma,0,3);
```

(%o1)  $f(i, j) := \sum_{\sigma=0}^3 R_{i,j,\sigma,0} gContr_{i,\sigma} gContr_{j,0,\sigma,0,3} +$

$\sum_{\sigma=0}^3 R_{i,j,\sigma,1} gContr_{i,\sigma} gContr_{j,1,\sigma,0,3} +$

$\sum_{\sigma=0}^3 R_{i,j,\sigma,2} gContr_{i,\sigma} gContr_{j,2,\sigma,0,3} +$

$\sum_{\sigma=0}^3 R_{i,j,\sigma,3} gContr_{i,\sigma} gContr_{j,3,\sigma,0,3}$

(%i2) /\* define coordinate vector \*/

```
array(x, 3);
[x[0],x[1],x[2],x[3]]: [t, x1, x2, x3];
```

(%o2) x

(%o3) [ t , x1 , x2 , x3 ]

(%i4) /\* g1 is symm. metric with indices 1...4 \*/

```
g1: matrix(
  [-1,0,0,0],
  [0,(cosh(3*t/a-1))^(2/3),0,0],
  [0,0,(cosh(3*t/a-1))^(2/3),0],
  [0,0,0,(cosh(3*t/a-1))^(2/3)]
);
```

(%o4) 
$$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & \cosh\left(\frac{3t}{a}-1\right)^{2/3} & 0 & 0 \\ 0 & 0 & \cosh\left(\frac{3t}{a}-1\right)^{2/3} & 0 \\ 0 & 0 & 0 & \cosh\left(\frac{3t}{a}-1\right)^{2/3} \end{bmatrix}$$

(%i5) /\* contravariant g is inverse of g \*/

```
gContr1: ratsimp(invert(g1));
```

$$\begin{pmatrix}
 -1 & 0 & 0 & 0 \\
 0 & \frac{1}{\cosh\left(\frac{3t-a}{a}\right)^{2/3}} & 0 & 0 \\
 0 & 0 & \frac{1}{\cosh\left(\frac{3t-a}{a}\right)^{2/3}} & 0 \\
 0 & 0 & 0 & \frac{1}{\cosh\left(\frac{3t-a}{a}\right)^{2/3}}
 \end{pmatrix}$$

(%i6)

```

/* g1 and gContr1 are transformed to g and gContr (indices 0...3) */
for mu:0 thru 3 do {
for nu:0 thru 3 do {
    g[mu,nu]: g1[mu+1, nu+1],
    gContr[mu,nu]: gContr1[mu+1, nu+1]
}}$

```

(%i7) /\* computation of Christoffel symbols  $\Gamma^{\sigma}_{\mu\nu}$  \*/

```

for sigma:0 thru 3 do {
for mu:0 thru 3 do {
for nu:0 thru 3 do {
    Gamma[sigma,mu,nu] :
    /* rho sum by function call: */
    sum(
        1/2 * gContr[sigma,rho]*(
            diff(g[nu,rho],x[mu]) +
            diff(g[rho,mu],x[nu]) -
            diff(g[mu,nu],x[rho])),
        rho, 0, 3),
    /* evaluate differentiation dy/dr */
    Gamma[sigma,mu,nu]: ev(Gamma[sigma,mu,nu],diff)
}}}$

```

(%i8) /\* display Gamma's being different from zero \*/

```

for i:0 thru 3 do {
for j:0 thru 3 do {
for k:0 thru 3 do {
    if Gamma[i,j,k] # 0 then {
        display(Gamma[i,j,k])
    }}}}$

```

$$\Gamma_{0,1,1} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3}}$$

$$\Gamma_{0,2,2} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3}}$$

$$\Gamma_{0,3,3} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3}}$$

$$\Gamma_{1,0,1} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3} \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

$$\Gamma_{1,1,0} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3} \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

$$\Gamma_{2,0,2} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3} \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

$$\Gamma_{2,2,0} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3} \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

$$\Gamma_{3,0,3} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3} \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

$$\Gamma_{3,3,0} = \frac{\sinh\left(\frac{3t}{a} - 1\right)}{a \cosh\left(\frac{3t}{a} - 1\right)^{1/3} \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

```
(%i9) /* compute Riemann tensor elements */
for rho:0 thru 3 do {
for sigma:0 thru 3 do {
for mu:0 thru 3 do {
for nu:0 thru 3 do {
R[rho,sigma,mu,nu] :
diff(Gamma[rho,nu,sigma],x[mu]) -
diff(Gamma[rho,mu,sigma],x[nu]) +
/* lambda sums by function call: */
sum(
Gamma[rho,mu,lambda] * Gamma[lambda,nu,sigma] -
Gamma[rho,nu,lambda] * Gamma[lambda,mu,sigma],
lambda, 0, 3)
}}}}$
```

```
(%i10) /* display R's being different from zero */
for i:0 thru 3 do {
for j:0 thru 3 do {
for k:0 thru 3 do {
for l:0 thru 3 do {
R[i,j,k,l] : /*ratsimp*/(factor(R[i,j,k,l])),
if R[i,j,k,l] # 0 then display(R[i,j,k,l])
}}}}$
```

$$R_{0,1,0,1} = - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{0,1,1,0} = \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{0,2,0,2} = - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{0,2,2,0} = \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{0,3,0,3} = - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{0,3,3,0} = \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{1,0,0,1} = - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$R_{1,0,1,0} = \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$R_{1,2,1,2} = \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{1,2,2,1} = - \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{1,3,1,3} = \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{1,3,3,1} = - \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{2,0,0,2} = - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$R_{2,0,2,0} = \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$R_{2,1,1,2} = - \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{2,1,2,1} = \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{2,3,2,3} = \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{2,3,3,2} = - \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{3,0,0,3} = - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$R_{3,0,3,0} = \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$R_{3,1,1,3} = - \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{3,1,3,1} = \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{3,2,2,3} = - \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

$$R_{3,2,3,2} = \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{4/3}}$$

```
(%i11) /* Ricci tensor Ric[mu,nu] */
for mu:0 thru 3 do {
for nu:0 thru 3 do {
Ric[mu,nu]: sum(R[lambda,mu,lambda,nu], lambda, 0, 3)
}}$
```

```
(%i12) /* display Ric's being different from zero */
for i:0 thru 3 do {
for j:0 thru 3 do {
Ric[i,j] : /*ratsimp*/(factor(Ric[i,j])),
if Ric[i,j] # 0 then display(Ric[i,j])
}}$
```

$$Ric_{0,0} = \frac{3 \left( 2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2 \right)}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$Ric_{1,1} = \frac{3 \cosh\left(\frac{3t-a}{a}\right)^{2/3}}{a^2}$$

$$Ric_{2,2} = \frac{3 \cosh\left(\frac{3t-a}{a}\right)^{2/3}}{a^2}$$

$$Ric_{3,3} = \frac{3 \cosh\left(\frac{3t-a}{a}\right)^{2/3}}{a^2}$$

```
(%i13) /* Ricci Scalar */
RicSc: sum(gContr[0,lambda]*Ric[lambda,0], lambda, 0, 3)
      + sum(gContr[1,lambda]*Ric[lambda,1], lambda, 0, 3)
      + sum(gContr[2,lambda]*Ric[lambda,2], lambda, 0, 3)
      + sum(gContr[3,lambda]*Ric[lambda,3], lambda, 0, 3)
;
```

$$(\%o13) \quad \frac{9}{a^2} - \frac{3 \left( 2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2 \right)}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

```
(%i14) ratsimp(RicSc);
```

$$(\%o14) \quad - \frac{6 \sinh\left(\frac{3t-a}{a}\right)^2 - 18 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

```
(%i15)
```

```
/* Test for R^q */
for mu: 0 thru 3 do (
for sigma:0 thru 3 do (
for nu: 0 thru 3 do (
for rho: 0 thru 3 do (
  R_q: R[mu,sigma,nu,rho] + R[mu,rho,sigma,nu] + R[mu,nu,rho,sigma],
  if R_q # 0 then (
    display("=====Einstein equation R^q=0 not fulfilled! "),
    display(mu,sigma,nu,rho),
    display(R_q)
  )
))));
```

```
(%o15) done
```

```
(%i16) /* Raising of indices,
        contravarinat metric el. is g^x^x(contr.) = 1/g_x_x(cov.) */
/*print("Riemann elements R^0_1^0^1, R^0_2^0^2, R^0_3^0^3:");*/
```

```
R0101: f(0,1);
R0202: f(0,2);
R0303: f(0,3);
```

$$(\%o16) \quad \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$(\%o17) \quad \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$(\%o18) \quad \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

(%i19) R0101: factor(R0101);  
 R0202: factor(R0202);  
 R0303: factor(R0303);

$$(\%o19) \quad \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$(\%o20) \quad \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

$$(\%o21) \quad \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

(%i22) R1010: f(1,0);  
 R1212: f(1,2);  
 R1313: f(1,3);

$$(\%o22) \quad - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o23) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o24) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

(%i25) R1010: factor(R1010);  
 R1212: factor(R1212);  
 R1313: factor(R1313);

$$(\%o25) \quad - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$



$$(\%o26) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o27) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

(%i28) R2020: f(2,0);  
 R2121: f(2,1);  
 R2323: f(2,3);

$$(\%o28) \quad - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o29) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o30) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

(%i31) R2020: factor(R2020);  
 R2121: factor(R2121);  
 R2323: factor(R2323);

$$(\%o31) \quad - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o32) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%o33) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

(%i34) R3030: f(3,0);  
 R3131: f(3,1);  
 R3232: f(3,2);

$$(\%034) \quad - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%035) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%036) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

```
(%i37) R3030: factor(R3030);
R3131: factor(R3131);
R3232: factor(R3232);
```

$$(\%037) \quad - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%038) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

$$(\%039) \quad \frac{\sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

```
(%i40) /* Coulomb law */
DivE : R0101 + R0202 + R0303;
```

$$(\%040) \quad \frac{3 \left( 2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2 \right)}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

```
(%i41) ratsimp(DivE);
```

$$(\%041) \quad \frac{6 \sinh\left(\frac{3t-a}{a}\right)^2 - 9 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^2}$$

```
(%i42) /* J[r] */
Jr : -(R1010 + R1212 + R1313);
```

```
(%o42)
```

$$\frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}} - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

```
(%i43) ratsimp(Jr);
```

```
(%o43)
```

$$-\frac{3}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

```
(%i44) /* J[theta] */
Jtheta : -(R2020 + R2121 + R2323);
```

```
(%o44)
```

$$\frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}} - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

```
(%i45) ratsimp(Jtheta);
```

```
(%o45)
```

$$-\frac{3}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

```
(%i46) /* J[phi] */
Jphi : -(R3030 + R3131 + R3232);
```

```
(%o46)
```

$$\frac{2 \sinh\left(\frac{3t-a}{a}\right)^2 - 3 \cosh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}} - \frac{2 \sinh\left(\frac{3t-a}{a}\right)^2}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{8/3}}$$

```
(%i47) ev(ratsimp(Jphi),r);
```

```
(%o47)
```

$$-\frac{3}{a^2 \cosh\left(\frac{3t-a}{a}\right)^{2/3}}$$

```
(%i48) DivE_p: ev(at(DivE,[a=1]));
```

```
(%o48)
```

$$\frac{3(2 \sinh(3t-1)^2 - 3 \cosh(3t-1)^2)}{\cosh(3t-1)^2}$$

```
(%i49) Jr_p: ev(at(Jr,[a=1]));
```

```
(%o49)
```

$$\frac{2 \sinh(3t-1)^2 - 3 \cosh(3t-1)^2}{\cosh(3t-1)^{8/3}} - \frac{2 \sinh(3t-1)^2}{\cosh(3t-1)^{8/3}}$$

```
(%i50) Jtheta_p: ev(at(Jtheta,[a=1]));
```

```
(%o50) 
$$\frac{2 \sinh(3 t - 1)^2 - 3 \cosh(3 t - 1)^2}{\cosh(3 t - 1)^{8/3}} - \frac{2 \sinh(3 t - 1)^2}{\cosh(3 t - 1)^{8/3}}$$

```

```
(%i51) Jphi_p: ev(at(Jphi,[a=1]));
```

```
(%o51) 
$$\frac{2 \sinh(3 t - 1)^2 - 3 \cosh(3 t - 1)^2}{\cosh(3 t - 1)^{8/3}} - \frac{2 \sinh(3 t - 1)^2}{\cosh(3 t - 1)^{8/3}}$$

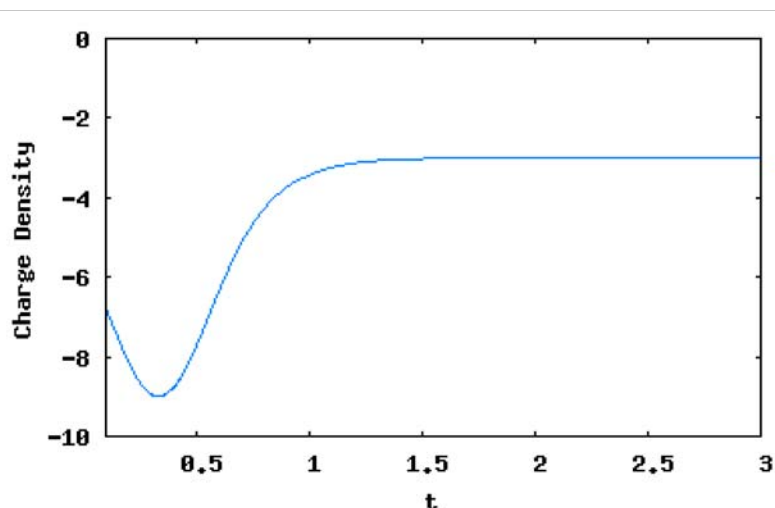
```

```
(%i52)
```

```
wxplot2d([DivE_p], [t,.1,3],[y,-10,0], [gnuplot_preamble, "set zeroaxis;"],
[xlabel, "t"], [ylabel, "Charge Density"])$
```

Output file "C:/Documents and Settings/Administrator/maxout.png".

```
(%t52)
```

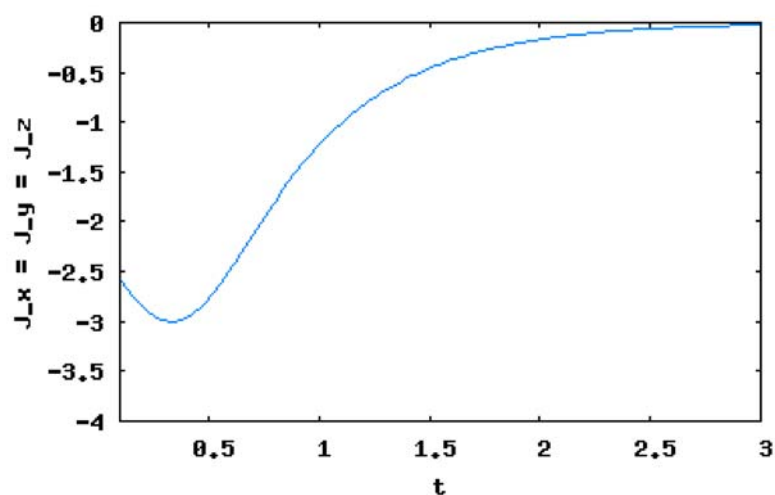


```
(%i53)
```

```
wxplot2d([Jr_p], [t,.1,3],[y,-4,0], [gnuplot_preamble, "set zeroaxis;"],
[xlabel, "t"], [ylabel, "J_x = J_y = J_z"])$
```

Output file "C:/Documents and Settings/Administrator/maxout.png".

```
(%t53)
```



(%i54)