```
> restart
> with(tensor) :
> coords := [t, r, theta, phi];
```

$$coords := [t, r, \theta, \phi] \tag{1}$$

```
> g := array(symmetric, sparse, 1 ..4, 1 ..4);
```

$$g := array(symmetric, sparse, 1 ..4, 1 ..4, [\ ]) \tag{2}$$

```
> g[1, 1] := -(1 + a·r^2)^3;
  g[2, 2] := (1 - 3·a·r^2/2 · (1 + c·(1 + 4·a·r^2))/(1 + a·r^2))^(1/2);
  g[3, 3] := r^2;
  g[4, 4] := r^2·(sin(theta))^2;
```

$$g_{1,1} := -(a r^2 + 1)^3$$

$$g_{2,2} := \sqrt{1 - \frac{3}{2}\,\frac{a r^2 (1 + c (4 a r^2 + 1))}{a r^2 + 1}}$$

$$g_{3,3} := r^2$$

$$g_{4,4} := r^2 \sin(\theta)^2 \tag{3}$$

```
> metric := create([-1,-1], eval(g));
```

$$metric := table\left(\left[\left[\ index\_char = [-1, -1], compts\right.\right.\right.$$

$$= \left.\left.\left.\begin{bmatrix} -(a r^2 + 1)^3 & 0 & 0 & 0 \\ 0 & \sqrt{1 - \frac{3}{2}\,\frac{a r^2 (1 + c (4 a r^2 + 1))}{a r^2 + 1}} & 0 & 0 \\ 0 & 0 & r^2 & 0 \\ 0 & 0 & 0 & r^2 \sin(\theta)^2 \end{bmatrix}\right]\right]\right) \tag{4}$$

```
> tensorsGR(coords, metric, contra_metric, det_met, C1, C2, Rm, Rc, R, G, C)
> displayGR(Einstein, G);
```

The Einstein Tensor

non-zero components :

$$G11 = -\left(12\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^5cr^{10}\right.$$
$$+39\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^4cr^8$$
$$+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^4r^8+18a^4cr^8-2a^4r^8$$
$$+45\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^3cr^6$$
$$+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^3r^6+36a^3cr^6+4a^3r^6$$
$$+21\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2cr^4$$
$$-3\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2r^4+18a^2cr^4+18a^2r^4$$
$$+3\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,acr^2$$
$$-5\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2+16ar^2$$
$$\left.-2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}+4\right)\Bigg/$$
$$\left(r^2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,\left(12a^2cr^4+3acr^2+ar^2-2\right)\right)$$

$$G22 = \frac{1}{2}\,\frac{1}{\left(ar^2+1\right)r^2}\left(\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2-14ar^2\right.$$
$$\left.+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}-2\right)$$

$$G33 = -\frac{3ar^2\left(56a^3cr^6+30a^2cr^4+6a^2r^4-12ar^2-c-9\right)}{\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,\left(ar^2+1\right)^2\left(12a^2cr^4+3acr^2+ar^2-2\right)}$$

$$G44 = -\frac{3\sin(\theta)^2ar^2\left(56a^3cr^6+30a^2cr^4+6a^2r^4-12ar^2-c-9\right)}{\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,\left(ar^2+1\right)^2\left(12a^2cr^4+3acr^2+ar^2-2\right)}$$

character : [-1, -1] **(5)**

```
> mixed := raise(contra_metric, G, 1);
```

$$mixed := table\left(\left[\, index\_char = [1, -1],\ compts = \left[\right.\right.\right.$$

(6)

$$\left[\left[\left(12\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^3cr^6 + 15\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2cr^4 + \sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2r^4 + 18a^2cr^4 - 2a^2r^4 + 3\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,acr^2 - \sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2 + 8ar^2 - 2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}} + 4\right)\middle/\left(r^2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,(12a^2cr^4+3acr^2+ar^2-2)(ar^2+1)\right),\right.\right.$$

$$\left.\left.0, 0, 0\right],\right.$$

$$\left[0, \left(\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2 - 14ar^2 + \sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}} - 2\right)\middle/\left(\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,(ar^2+1)r^2\right), 0, 0\right],$$

$$\left[0, 0,\right.$$

$$\left.\left.-\frac{3a(56a^3cr^6+30a^2cr^4+6a^2r^4-12ar^2-c-9)}{\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,(ar^2+1)^2(12a^2cr^4+3acr^2+ar^2-2)}, 0\right.\right.$$

$$\Bigg],$$

$$\Bigg[0, 0, 0,$$

$$-\frac{3\,a\,(56\,a^3\,c\,r^6+30\,a^2\,c\,r^4+6\,a^2\,r^4-12\,a\,r^2-c-9)}{\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}\,(a\,r^2+1)^2\,(12\,a^2\,c\,r^4+3\,a\,c\,r^2+a\,r^2-2)}\Bigg]\Bigg]\Bigg]$$

$$\Bigg)$$

```
> eval( (6), [a = 0.0005, c = 1.13]);
```

$$table\Bigg(\Bigg[index\_char=[1,\ -1],\ compts=\Bigg[\tag{7}$$

$$\Bigg[\Bigg(1.69500\ 10^{-9}\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^6$$

$$+0.0000044875\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^4+0.0000045850\,r^4$$

$$+0.001195\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2+0.0040\,r^2$$

$$-2\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}+4\Bigg)\Bigg/$$

$$\Bigg(r^2\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,(0.0000033900\,r^4+0.002195\,r^2$$

$$-2)\,(0.0005\,r^2+1)\Bigg),0,0,0\Bigg],$$

$$\Bigg[0,\Bigg(0.0005\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2-0.0070\,r^2$$

$$+\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}-2\Bigg)\Bigg/$$

$$\left(\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,\left(0.0005\,r^2+1\right)\,r^2\right),0,0\Bigg],$$

$$\Bigg[0,0,-\left(0.0015\,\left(7.91000\,10^{-9}\,r^6+0.0000099750\,r^4-0.0060\,r^2-10.13\right)\right)\Big/$$

$$\left(\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,\left(0.0005\,r^2+1\right)^2\left(0.0000033900\,r^4\right.\right.$$

$$\left.\left.+0.002195\,r^2-2\right)\right),0\Bigg],$$

$$\Bigg[0,0,0,-\left(0.0015\,\left(7.91000\,10^{-9}\,r^6+0.0000099750\,r^4-0.0060\,r^2-10.13\right)\right)\Big/$$

$$\left(\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,\left(0.0005\,r^2+1\right)^2\left(0.0000033900\,r^4\right.\right.$$

$$\left.\left.+0.002195\,r^2-2\right)\right)\Bigg]\Bigg]\Bigg]\Bigg]\Bigg)$$

```
> simplify( (7) );
```

$$table\left(\left[index\_char=[1,-1],compts=\left[\right.\right.\right. \tag{8}$$

$$\Bigg[\Bigg(1.695000000\,10^{-9}\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^6$$

$$+0.000004487500000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^4$$

$$+0.000004585000000\,r^4$$

$$+0.001195000000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2$$

$$+0.004000000000\,r^2-2.\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}+4.\Bigg)$$

$$\Big/\Bigg(\left(0.0005000000000\,r^2+1.\right)\left(0.000003390000000\,r^4+0.002195000000\,r^2\right.$$

$$\left.-2.\right)\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2\Bigg),0,0,0\Bigg],$$

$$\left[0, \left(0.0005000000000 \sqrt{-\frac{0.000006780000000\, r^4 + 0.004390000000\, r^2 - 4.}{0.0005000000000\, r^2 + 1.}}\, r^2 - 0.007000000000\, r^2 + \sqrt{-\frac{0.000006780000000\, r^4 + 0.004390000000\, r^2 - 4.}{0.0005000000000\, r^2 + 1.}} - 2.\right) \Big/ \left(r^2 \left(0.0005000000000\, r^2 + 1.\right) \sqrt{-\frac{0.000006780000000\, r^4 + 0.004390000000\, r^2 - 4.}{0.0005000000000\, r^2 + 1.}}\right), 0, 0\right],$$

$$\left[0, 0, -\left(0.0015 \left(7.910000000\, 10^{-9}\, r^6 + 0.000009975000000\, r^4 - 0.006000000000\, r^2 - 10.13000000\right)\right) \Big/ \left(\left(0.000003390000000\, r^4 + 0.002195000000\, r^2 - 2.\right) \left(0.0005\, r^2 + 1.\right)^2 \sqrt{-\frac{0.000006780000000\, r^4 + 0.004390000000\, r^2 - 4.}{0.0005000000000\, r^2 + 1.}}\right), 0\right],$$

$$\left[0, 0, 0, -\left(0.0015 \left(7.910000000\, 10^{-9}\, r^6 + 0.000009975000000\, r^4 - 0.006000000000\, r^2 - 10.13000000\right)\right) \Big/ \left(\left(0.000003390000000\, r^4 + 0.002195000000\, r^2 - 2.\right) \left(0.0005\, r^2 + 1.\right)^2 \sqrt{-\frac{0.000006780000000\, r^4 + 0.004390000000\, r^2 - 4.}{0.0005000000000\, r^2 + 1.}}\right)\right]\right]\right]\right]$$

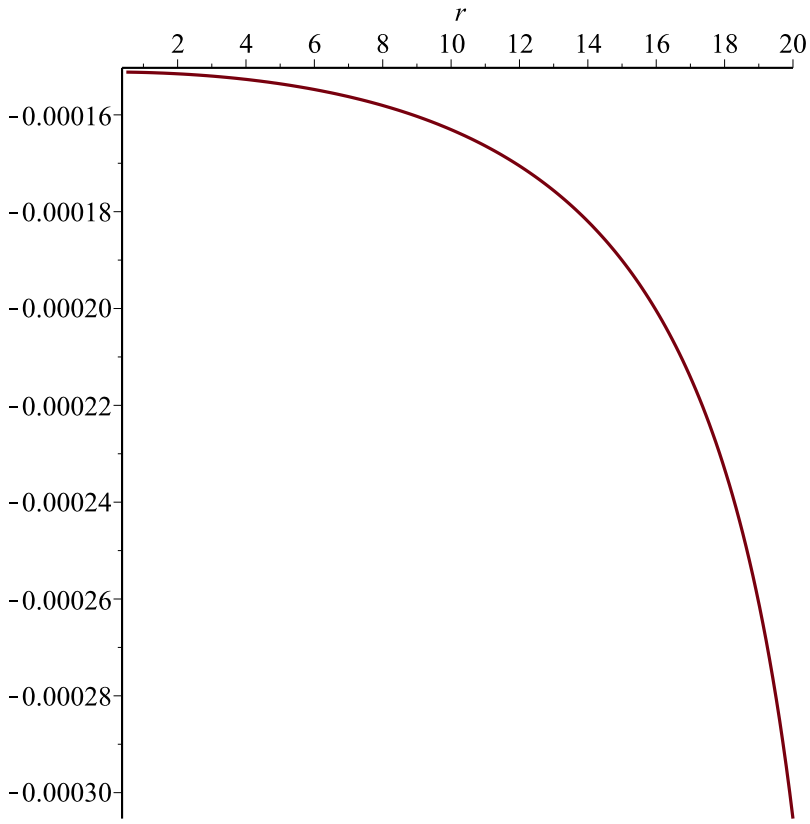
```
> p(r) = 1/(8*pi)*(0.0005*sqrt(-(0.0000067800*r^4+0.004390*r^2-4)/(0.0005*r^2+1))*r^2-0.0070*r^2
      +sqrt(-(0.0000067800*r^4+0.004390*r^2-4)/(0.0005*r^2+1))-2)/
      (sqrt(-(0.0000067800*r^4+0.004390*r^2-4)/(0.0005*r^2+1))*(0.0005*r^2+1)*r^2);
```

$$p(r) = \frac{1}{8}\left(0.0005 \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\, r^2 - 0.0070\, r^2 + \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}} - 2\right) \Big/ \tag{9}$$

$$\left(\pi \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\ \left(0.0005\, r^2 + 1\right) r^2\right)$$

>

> $$plot\left(\frac{1}{8}\left(0.0005 \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\ r^2 - 0.0070\, r^2 + \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}} - 2\right) \Big/ \left(\pi \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\ \left(0.0005\, r^2 + 1\right) r^2\right), r = 0.5 \ldots 20\right);$$



>

(10)

(11)

> *restart*

> *with*(*tensor*) :

> *coords* := [*t*, *r*, theta, phi];

$$coords := [t, r, \theta, \phi] \tag{12}$$

```
> g := array(symmetric, sparse, 1..4, 1..4);
```

$$g := array(symmetric, sparse, 1..4, 1..4, [\,]) \tag{13}$$

```
> g[1,1] := -(1 + a*r^2)^3;
  g[2,2] := (1 - 3*a*r^2/2 * (1 + c*(1 + 4*a*r^2))/(1 + a*r^2))^(1/2);
  g[3,3] := r^2;
  g[4,4] := r^2*(sin(theta))^2;
```

$$g_{1,1} := -(a\,r^2 + 1)^3$$

$$g_{2,2} := \sqrt{1 - \frac{3}{2}\,\frac{a\,r^2\,(1 + c\,(4\,a\,r^2 + 1))}{a\,r^2 + 1}}$$

$$g_{3,3} := r^2$$

$$g_{4,4} := r^2 \sin(\theta)^2 \tag{14}$$

```
> metric := create([-1,-1], eval(g));
```

$$metric := table\left(\left[\left[\, index\_char = [-1, -1], compts \right.\right.\right.$$

$$= \left.\left.\left.\begin{bmatrix} -(a\,r^2+1)^3 & 0 & 0 & 0 \\ 0 & \sqrt{1 - \frac{3}{2}\,\frac{a\,r^2\,(1 + c\,(4\,a\,r^2+1))}{a\,r^2+1}} & 0 & 0 \\ 0 & 0 & r^2 & 0 \\ 0 & 0 & 0 & r^2\sin(\theta)^2 \end{bmatrix}\right]\right]\right) \tag{15}$$

```
> tensorsGR(coords, metric, contra_metric, det_met, C1, C2, Rm, Rc, R, G, C)
> displayGR(Einstein, G);
```

The Einstein Tensor

non-zero components :

$$G11 = -\left(12 \sqrt{-\frac{24\,a^2\,c\,r^4 + 6\,a\,c\,r^2 + 2\,a\,r^2 - 4}{a\,r^2 + 1}}\; a^5\,c\,r^{10}\right.$$

$$+39\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^4cr^8$$

$$+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^4r^8+18a^4cr^8-2a^4r^8$$

$$+45\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^3cr^6$$

$$+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^3r^6+36a^3cr^6+4a^3r^6$$

$$+21\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2cr^4$$

$$-3\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2r^4+18a^2cr^4+18a^2r^4$$

$$+3\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,acr^2$$

$$-5\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2+16ar^2$$

$$-2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}+4\Bigg)\Bigg/$$

$$\left(r^2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,\left(12a^2cr^4+3acr^2+ar^2-2\right)\right)$$

$$G22=\frac{1}{2}\,\frac{1}{\left(ar^2+1\right)r^2}\left(\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2-14ar^2\right.$$

$$\left.+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}-2\right)$$

$$G33=-\frac{3ar^2\left(56a^3cr^6+30a^2cr^4+6a^2r^4-12ar^2-c-9\right)}{\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,\left(ar^2+1\right)^2\left(12a^2cr^4+3acr^2+ar^2-2\right)}$$

$$G44=-\frac{3\sin(\theta)^2ar^2\left(56a^3cr^6+30a^2cr^4+6a^2r^4-12ar^2-c-9\right)}{\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,\left(ar^2+1\right)^2\left(12a^2cr^4+3acr^2+ar^2-2\right)}$$

character : [-1, -1] **(16)**

```
> mixed := raise(contra_metric, G, 1);
```

$$mixed := table\left(\left[index\_char = [1, -1],\ compts = \left[\right.\right.\right. \tag{17}$$

$$\left[\left(\left(12\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^3cr^6\right.\right.\right.$$

$$+15\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2cr^4$$

$$+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,a^2r^4+18a^2cr^4-2a^2r^4$$

$$+3\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,acr^2$$

$$-\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2+8ar^2$$

$$\left.-2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}+4\right)\Big/$$

$$\left(r^2\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,(12a^2cr^4+3acr^2+ar^2-2)\,(ar^2+1)\right),$$

$$0,0,0\Bigg],$$

$$\left[0,\left(\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,ar^2-14ar^2\right.\right.$$

$$\left.+\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}-2\right)\Big/$$

$$\left(\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,(ar^2+1)\,r^2\right),0,0\Bigg],$$

$$\left[0,0,\right.$$

$$\left.\left.-\frac{3a\,(56a^3cr^6+30a^2cr^4+6a^2r^4-12ar^2-c-9)}{\sqrt{-\frac{24a^2cr^4+6acr^2+2ar^2-4}{ar^2+1}}\,(ar^2+1)^2\,(12a^2cr^4+3acr^2+ar^2-2)},0\right.\right.$$

$$\Bigg],$$

$$\Bigg[0, 0, 0,$$

$$-\frac{3\,a\,(56\,a^3\,c\,r^6+30\,a^2\,c\,r^4+6\,a^2\,r^4-12\,a\,r^2-c-9)}{\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}\;(a\,r^2+1)^2\,(12\,a^2\,c\,r^4+3\,a\,c\,r^2+a\,r^2-2)}\Bigg]\Bigg]\Bigg]$$

$$\Bigg)$$

```
> eval( (17), [a = 0.0005, c = 1.13]);
```

$$table\Bigg(\Bigg[index\_char=[1,-1],\,compts=\Bigg[\qquad \textbf{(18)}$$

$$\Bigg[\Bigg(1.69500\,10^{-9}\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^6$$

$$+0.0000044875\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^4+0.0000045850\,r^4$$

$$+0.001195\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2+0.0040\,r^2$$

$$-2\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}+4\Bigg)\Bigg/$$

$$\Bigg(r^2\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,(0.0000033900\,r^4+0.002195\,r^2$$

$$-2)\,(0.0005\,r^2+1)\Bigg),0,0,0\Bigg],$$

$$\Bigg[0,\Bigg(0.0005\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2-0.0070\,r^2$$

$$+\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}-2\Bigg)\Bigg/$$

$$\left(\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,\left(0.0005\,r^2+1\right)\,r^2\right),0,0\Bigg],$$

$$\Bigg[0,0,-\left(0.0015\,\left(7.91000\,10^{-9}\,r^6+0.0000099750\,r^4-0.0060\,r^2-10.13\right)\right)\Big/$$

$$\left(\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,\left(0.0005\,r^2+1\right)^2\left(0.0000033900\,r^4\right.\right.$$

$$\left.\left.+0.002195\,r^2-2\right)\right),0\Bigg],$$

$$\Bigg[0,0,0,-\left(0.0015\,\left(7.91000\,10^{-9}\,r^6+0.0000099750\,r^4-0.0060\,r^2-10.13\right)\right)\Big/$$

$$\left(\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,\left(0.0005\,r^2+1\right)^2\left(0.0000033900\,r^4\right.\right.$$

$$\left.\left.+0.002195\,r^2-2\right)\right)\Bigg]\Bigg]\Bigg]\Bigg]\Bigg)$$

```
> simplify( (18) );
```

$$table\left(\left[index\_char=[1,-1],compts=\left[\right.\right.\right. \tag{19}$$

$$\Bigg[\Bigg(1.695000000\,10^{-9}\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^6$$

$$+0.000004487500000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^4$$

$$+0.000004585000000\,r^4$$

$$+0.001195000000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2$$

$$+0.004000000000\,r^2-2.\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}+4.\Bigg)$$

$$\Big/\Bigg(\left(0.0005000000000\,r^2+1.\right)\left(0.000003390000000\,r^4+0.002195000000\,r^2\right.$$

$$\left.-2.\right)\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2\Bigg),0,0,0\Bigg],$$

$$\left[0,\left(0.0005000000000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2-0.007000000000\,r^2+\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}-2.\right)\Big/\left(r^2\left(0.0005000000000\,r^2+1.\right)\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\right),0,0\right],$$

$$\left[0,0,-\left(0.0015\left(7.910000000\,10^{-9}\,r^6+0.000009975000000\,r^4-0.006000000000\,r^2-10.13000000\right)\right)\Big/\left(\left(0.000003390000000\,r^4+0.002195000000\,r^2-2.\right)\left(0.0005\,r^2+1.\right)^2\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\right),0\right],$$

$$\left[0,0,0,-\left(0.0015\left(7.910000000\,10^{-9}\,r^6+0.000009975000000\,r^4-0.006000000000\,r^2-10.13000000\right)\right)\Big/\left(\left(0.000003390000000\,r^4+0.002195000000\,r^2-2.\right)\left(0.0005\,r^2+1.\right)^2\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\right)\right]\right]\right]\right)$$

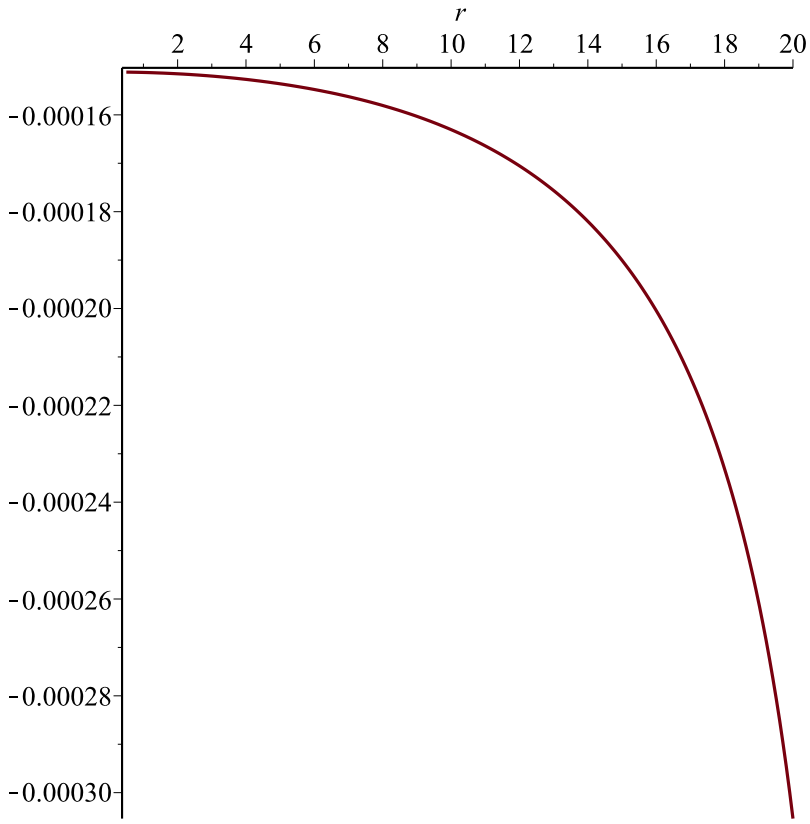
```
> p(r) = 1/(8*pi)*(0.0005*sqrt(-(0.0000067800*r^4+0.004390*r^2-4)/(0.0005*r^2+1))*r^2-0.0070*r^2
      +sqrt(-(0.0000067800*r^4+0.004390*r^2-4)/(0.0005*r^2+1))-2)/
      (sqrt(-(0.0000067800*r^4+0.004390*r^2-4)/(0.0005*r^2+1))*(0.0005*r^2+1)*r^2);
```

$$p(r)=\frac{1}{8}\left(0.0005\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2-0.0070\,r^2+\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}-2\right)\Big/ \tag{20}$$

$$\left(\pi \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\ \left(0.0005\, r^2 + 1\right) r^2\right)$$

>

> $$plot\left(\frac{1}{8}\left(0.0005 \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\ r^2 - 0.0070\, r^2 + \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}} - 2\right) \Big/ \left(\pi \sqrt{-\frac{0.0000067800\, r^4 + 0.004390\, r^2 - 4}{0.0005\, r^2 + 1}}\ \left(0.0005\, r^2 + 1\right) r^2\right), r = 0.5 \ldots 20\right);$$



>

>

>

(21)

(22)

(23)

```
>
```

$$\rho(r) = -\frac{1}{8\cdot \mathrm{pi}}\cdot\frac{1}{\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}}\left(12\cdot a^3\cdot c\cdot r^6\cdot\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}+15\cdot a^2\cdot c\cdot r^4\cdot\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}+18\cdot a^2\cdot c\cdot r^4-2\cdot a^2\cdot r^4+3\cdot a\cdot c\cdot r^2\cdot\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}-a\cdot r^2\cdot\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}+8\cdot a\cdot r^2-2\cdot\sqrt{-\frac{24\,a^2\,c\,r^4+6\,a\,c\,r^2+2\,a\,r^2-4}{a\,r^2+1}}+4\right)\Big/\left(r^2\cdot(a\cdot r^2+1)\cdot(12\cdot a^2\cdot c\cdot r^4+3\cdot a\cdot c\cdot r^2+a\cdot r^2-2)\right)$$

```
> eval( rho(r) = -(12*sqrt(-(24*a^2*c*r^4+6*a*c*r^2+2*a*r^2-4)/(a*
  r^2+1))*a^3*c*r^6+15*sqrt(-(24*a^2*c*r^4+6*a*c*r^2+2*a*r^2-4)/(a*
  r^2+1))*a^2*c*r^4+18*a^2*c*r^4-2*a^2*r^4+3*a*c*(r^2)^sqrt(-(24*
  a^2*c*r^4+6*a*c*r^2+2*a*r^2-4)/(a*r^2+1))-sqrt(-(24*a^2*c*r^4+6*
  a*c*r^2+2*a*r^2-4)/(a*r^2+1))*a*r^2+8*a*r^2-2*sqrt(-(24*a^2*c*
  r^4+6*a*c*r^2+2*a*r^2-4)/(a*r^2+1))+4)/((8*pi)*sqrt(-(24*a^2*c*
  r^4+6*a*c*r^2+2*a*r^2-4)/(a*r^2+1))*r^2*(a*r^2+1)*(12*a^2*c*
  r^4+3*a*c*r^2+a*r^2-2)), [a = 0.0005, c = 1.13]);
```

$$\rho(r) = -\frac{1}{8}\left(1.69500\ 10^{-9}\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^6+0.0000042375\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^4+0.0000045850\,r^4+0.001695\,(r^2)^{\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}}-0.0005\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2+0.0040\,r^2\right)$$

(24)

$$-2\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}+4\Bigg)\Bigg/\Bigg(\pi\sqrt{-\frac{0.0000067800\,r^4+0.004390\,r^2-4}{0.0005\,r^2+1}}\,r^2\,(0.0005\,r^2+1)\,(0.0000033900\,r^4+0.002195\,r^2-2)\Bigg)$$

```
> simplify( (24) );
```

$$\rho(r)=-\frac{1}{8}\Bigg(1.695000000\,10^{-9}\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^6+0.000004237500000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^4+0.000004585000000\,r^4+0.001695000000\,(r^2)\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}-0.0005000000000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2+0.004000000000\,r^2-2.\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}+4.\Bigg)\Bigg/\Bigg((0.000003390000000\,r^4+0.002195000000\,r^2-2.)\,(0.0005000000000\,r^2+1.)\,r^2\,\pi\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\Bigg) \tag{25}$$

```
> plot( -1/8 ( 1.695000000 10^-9 sqrt( -(0.000006780000000 r^4 + 0.004390000000 r^2 - 4.)/(0.0005000000000 r^2 + 1.) ) r^6
```

$$+0.000004237500000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^4$$

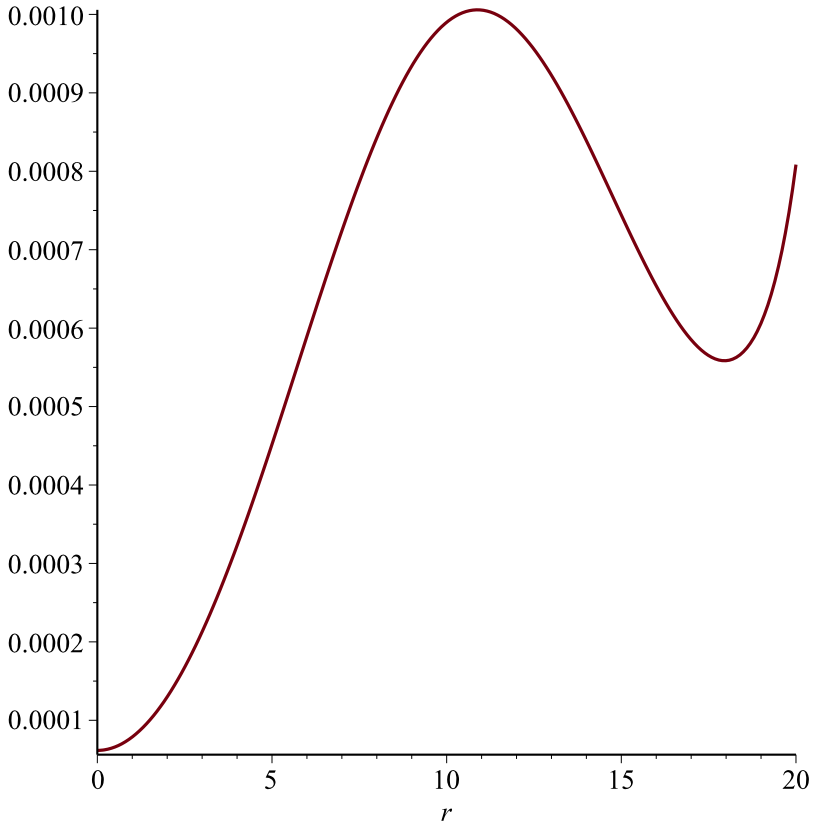
$$+0.000004585000000\,r^4$$

$$+0.001695000000\,\left(r^2\right)\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}$$

$$-0.0005000000000\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\,r^2$$

$$+0.004000000000\,r^2-2.\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}+4.\Bigg)$$

$$\Bigg/\left(\left(0.000003390000000\,r^4+0.002195000000\,r^2-2.\right)\left(0.0005000000000\,r^2+1.\right)r^2\,\pi\sqrt{-\frac{0.000006780000000\,r^4+0.004390000000\,r^2-4.}{0.0005000000000\,r^2+1.}}\right),\,r=0\,..20\Bigg)$$


0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
5
10
15
20
r