

Exercise 6.5 Digging into Cadabra's datastructure

```
1  {\theta, \varphi}::Coordinate.
2  {a,b,c,d,e,f,g,h#}::Indices(values={\theta, \varphi}, position=independent).
3
4  theta{#}::LaTeXForm{"\theta"}.
5  varphi{#}::LaTeXForm{"\varphi"}.
6
7  gab := { g_{\theta \theta} = r**2,
8           g_{\varphi \varphi} = r**2 \sin(\theta)**2 }. # cdb(ex-0605.100,gab)
9
10 metric := g_{a b} -> g_{a b}. # a trivial rule :)
11
12 evaluate (metric,gab,rhsonly=True)
13
14 indcs = metric[1][2][1][0] # cdb(ex-0605.101,indcs)
15 compt = metric[1][2][1][1] # cdb(ex-0605.102,compt)
16
17 # cdbBeg(print.0605)
18 print ('metric = ' + str(metric.input_form())+'\n') # reveals Cadabra's internal structure for storing metric
19
20 print ('metric[0] = ' + str(metric[0]))
21 print ('metric[1] = ' + str(metric[1])+'\n')
22
23 print ('metric[1][0] = ' + str(metric[1][0]))
24 print ('metric[1][1] = ' + str(metric[1][1]))
25 print ('metric[1][2] = ' + str(metric[1][2])+'\n')
26
27 print ('metric[1][2][1] = '+ str(metric[1][2][1]))
28 print ('metric[1][2][1][0] = '+ str(metric[1][2][1][0]))
29 print ('metric[1][2][1][1] = '+ str(metric[1][2][1][1]))
30 # cdbEnd(print.0605)
```

$$[\varphi, \varphi] \quad (\text{ex-0605.101})$$

$$r^2(\sin \theta)^2 \quad (\text{ex-0605.102})$$

$$g_{\varphi\varphi} = g_{[\varphi, \varphi]} \quad (\text{ex-0605.101})$$

$$= r^2(\sin \theta)^2 \quad (\text{ex-0605.102})$$

```

1 metric = g_{a b} -> \components_{a b}({\theta, \theta} = (r)**2, {\varphi, \varphi} = (r)**2 (\sin(\theta))**2)
2
3 metric[0] = g_{a b}
4 metric[1] = \components_{a b}({\theta, \theta} = (r)**2, {\varphi, \varphi} = (r)**2 (\sin(\theta))**2)
5
6 metric[1][0] = a
7 metric[1][1] = b
8 metric[1][2] = {\theta, \theta} = (r)**2, {\varphi, \varphi} = (r)**2 (\sin(\theta))**2}
9
10 metric[1][2][1] = {\varphi, \varphi} = (r)**2 (\sin(\theta))**2
11 metric[1][2][1][0] = {\varphi, \varphi}
12 metric[1][2][1][1] = (r)**2 (\sin(\theta))**2

```