PhysRevD.62.044034 equation (10)

```
from shared import *
import cdblib

jsonfile = 'eqtn10.json'
cdblib.create (jsonfile)

DgijDt  = cdblib.get ('adm.DgijDt','adm.json')
DdetgDt = cdblib.get ('adm.DdetgDt','adm.json')

# ----------------------------------------------------------------------

phi   := \phi -> (1/12) \log(detg).
gdotK := g^{i j} K_{i j} -> trK.

# ----------------------------------------------------------------------
# d\phi/dt

dotphi := \partial_{t}{\phi}.     # cdb (eq10.101,dotphi)

substitute (dotphi, phi)          # cdb (eq10.102,dotphi)
substitute (dotphi, dlog)         # cdb (eq10.103,dotphi)
substitute (dotphi, DdetgDt)      # cdb (eq10.104,dotphi)
substitute (dotphi, DgijDt)       # cdb (eq10.105,dotphi)
substitute (dotphi, gdotK)        # cdb (eq10.106,dotphi)
map_sympy  (dotphi, "simplify")   # cdb (eq10.107,dotphi)

DphiDt := \partial_{t}{\phi} -> @(dotphi).

cdblib.put ('DphiDt',DphiDt,jsonfile)
```

$$\partial_t \phi = \frac{1}{12} \partial_t \left(\log \left(g \right) \right) \tag{eq10.102}$$

$$= \frac{1}{12} g^{-1} \partial_t g \tag{eq10.103}$$

$$= \frac{1}{12} g^{-1} g g^{ij} \partial_t g_{ij} \tag{eq10.104}$$

$$= -\frac{1}{6} g^{-1} g g^{ij} N K_{ij} \tag{eq10.105}$$

$$= -\frac{1}{6} g^{-1} g \mathrm{tr} K N \tag{eq10.106}$$

$$= -\frac{1}{6} \mathrm{tr} K N \tag{eq10.107}$$

```
# ------------------------------------------------------------------------
# Check against prd62.

foo := @(dotphi).                                   # cdb(eq10.lcb,foo)
bah  = cdblib.get('prd62.eq10.rhs','prd62.json')    # cdb(eq10.prd,bah)

diff := @(foo) - @(bah).

diff = product_sort (diff)
rename_dummies (diff)
canonicalise   (diff)                               # cdb(eq10.chk,diff)
```

$$\texttt{eq10.lcb} := -\frac{1}{6}\mathrm{tr}KN$$

$$\texttt{eq10.prd} := -\frac{1}{6}N\mathrm{tr}K$$

$$\texttt{eq10.chk} := 0$$