

## Exercise 6.2 Evaluate on an expression (not a rule)

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1  {\theta, \varphi}::Coordinate.
2  {a,b,c,d,e,f,g,h#}::Indices(values={\theta, \varphi}, position=independent).
3
4  \partial{#}::PartialDerivative.
5
6  V := { V_{\theta} = f(\theta,\varphi), V_{\varphi} = g(\theta,\varphi) }. # cdb(ex-0602.100,V)
7  dV := \partial_{b}{V_{a}} + \partial_{a}{V_{b}}. # cdb(ex-0602.101,dV)
8
9  evaluate (dV, V) # cdb(ex-0602.102,dV)

```

$$V_a = [V_\theta = f(\theta, \varphi), V_\varphi = g(\theta, \varphi)] \quad (\text{ex-0602.100})$$

$$\partial_b V_a + \partial_a V_b \quad (\text{ex-0602.101})$$

$$\square_{ab} \begin{cases} \square_{\varphi\varphi} = 2\partial_\varphi g(\theta, \varphi) \\ \square_{\varphi\theta} = \partial_\varphi f(\theta, \varphi) + \partial_\theta g(\theta, \varphi) \\ \square_{\theta\varphi} = \partial_\varphi f(\theta, \varphi) + \partial_\theta g(\theta, \varphi) \\ \square_{\theta\theta} = 2\partial_\theta f(\theta, \varphi) \end{cases} \quad (\text{ex-0602.102})$$