

Exercise 2.7 Selective kill

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1 {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u#}::Indices(position=independent).
2
3 \partial{#}::PartialDerivative.
4
5 hide := \partial_{d}{\Gamma^{a}_{b c}} -> Z_{d a b c}.
6 reveal := Z_{d a b c} -> \partial_{d}{\Gamma^{a}_{b c}}.
7
8 kill := \Gamma^{a}_{b c} -> 0.
9
10 Gamma := \Gamma^{a}_{b c}
11         + x^{d} \partial_{d}{\Gamma^{a}_{b c}}.      # cdb (ex-0207.101,Gamma)
12
13 substitute (Gamma,hide)      # cdb (ex-0207.102,Gamma)
14 substitute (Gamma,kill)     # cdb (ex-0207.103,Gamma)
15 substitute (Gamma,reveal)   # cdb (ex-0207.104,Gamma)

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$$\begin{aligned}
 \Gamma^a_{bc}(x) &= \Gamma^a_{bc} + x^d \partial_d \Gamma^a_{bc} && (\text{ex-0207.101}) \\
 &= \Gamma^a_{bc} + x^d Z_{dabc} && (\text{ex-0207.102}) \\
 &= x^d Z_{dabc} && (\text{ex-0207.103}) \\
 &= x^d \partial_d \Gamma^a_{bc} && (\text{ex-0207.104})
 \end{aligned}$$

Exercise 2.7 Naive kill

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1 {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u#}::Indices(position=independent).
2
3 \partial{#}::Derivative.
4
5 kill := \Gamma^{a}_{b c} -> 0.
6
7 Gamma := \Gamma^{a}_{b c}
8         + x^{d} \partial_{d}\{\Gamma^{a}_{b c}\}.      # cdb (ex-0207.201,Gamma)
9
10 substitute (Gamma,kill)                        # cdb (ex-0207.202,Gamma)

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$$\Gamma^a_{bc}(x) = \Gamma^a_{bc} + x^d \partial_d \Gamma^a_{bc} \quad (\text{ex-0207.201})$$

$$= 0 \quad (\text{ex-0207.202})$$

Exercise 2.7 No problem killing partial derivatives

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1 {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u#}::Indices(position=independent).
2
3 \partial{#}::PartialDerivative.
4
5 kill := \partial_{c}\{A_{a b}\} -> 0.
6
7 Aab := A_{a b} + x^{c} \partial_{c}\{A_{a b}\}
8        + x^{c} x^{d} \partial_{d}\{\partial_{c}\{A_{a b}\}\}.      # cdb (ex-0207.301,Aab)
9
10 substitute (Aab,kill)                        # cdb (ex-0207.302,Aab)

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$$A_{ab}(x) = A_{ab} + x^c \partial_c A_{ab} + x^c x^d \partial_{dc} A_{ab} \quad (\text{ex-0207.301})$$

$$= A_{ab} + x^c x^d \partial_{dc} A_{ab} \quad (\text{ex-0207.302})$$