

## Exercise 4.4 Reformatting simple expressions

```
1 {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w#}::Indices(position=independent).
2
3
4 \nabla{#}::Derivative.
5
6 def reformat (obj,scale):
7
8     {x^{a},A_{a b},B_{a b},C_{a b},g^{a b}}::SortOrder. # choose a sort order
9
10    foo = Ex(str(scale)) # create a scale factor
11    bah := @(foo) @(obj). # apply the scale factor, clears all fractions
12
13    distribute (bah) # only required if (bah) contains brackets
14    sort_product (bah)
15    rename_dummies (bah)
16    canonicalise (bah)
17    factor_out (bah,$x^{a?}$)
18
19    ans := @(bah) / @(foo). # undo previous scaling
20
21    return ans
22
23 # -----
24
25 # a messy unformatted expression
26
27 expr := + (1/3) A_{a b} x^{a} x^{b}
28         + (1/9) B_{e c} x^{c} x^{e}
29         - (1/5) C_{p c} B_{d q} g^{c d} x^{p} x^{q}. # cdb (ex-0404.100,expr)
30
31 # reformat terms and tidy fractions
32
33 expr = reformat (expr,45) # cdb(ex-0404.101,expr)
```

$$g = \frac{1}{3} A_{ab} x^a x^b + \frac{1}{9} B_{ec} x^c x^e - \frac{1}{5} C_{pc} B_{dq} g^{cd} x^p x^q \quad (\text{ex-0404.100})$$

$$= \frac{1}{45} x^a x^b (15 A_{ab} + 5 B_{ab} - 9 B_{ca} C_{bd} g^{dc}) \quad (\text{ex-0404.101})$$