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In[1]:= Quartic@x_, y_, z_D = a_0 * x^4 + a_1 * x^3 * y + a_2 * x^3 * z + a_3 * x^3 + a_4 * x^2 * y^2 +
a_5 * x^2 * y * z + a_6 * x^2 * y + a_7 * x^2 * z^2 + a_8 * x^2 * z + a_9 * x^2 +
a_10 * x * y^3 + a_11 * x * y^2 * z + a_12 * x * y^2 + a_13 * x * y * z^2 + a_14 * x * y * z +
a_15 * x * y + a_16 * x * z^3 + a_17 * x * z^2 + a_18 * x * z + a_19 * x +
a_20 * y^4 + a_21 * y^3 * z + a_22 * y^3 + a_23 * y^2 * z^2 + a_24 * y^2 * z +
a_25 * y^2 + a_26 * y * z^3 + a_27 * y * z^2 + a_28 * y * z + a_29 * y +
a_30 * z^4 + a_31 * z^3 + a_32 * z^2 + a_33 * z + a_34
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Out[1]= x^4 a_0 + x^3 y a_1 + x^3 z a_2 + x^3 a_3 + x^2 y^2 a_4 + x^2 y z a_5 + x^2 y a_6 + x^2 z^2 a_7 +
x^2 z a_8 + x^2 a_9 + x y^3 a_10 + x y^2 z a_11 + x y^2 a_12 + x y z^2 a_13 + x y z a_14 + x y a_15 +
x z^3 a_16 + x z^2 a_17 + x z a_18 + x a_19 + y^4 a_20 + y^3 z a_21 + y^3 a_22 + y^2 z^2 a_23 + y^2 z a_24 +
y^2 a_25 + y z^3 a_26 + y z^2 a_27 + y z a_28 + y a_29 + z^4 a_30 + z^3 a_31 + z^2 a_32 + z a_33 + a_34

x^4 a_0 + x^3 y a_1 + x^3 z a_2 + x^3 a_3 + x^2 y^2 a_4 + x^2 y z a_5 + x^2 y a_6 + x^2 z^2 a_7 +
x^2 z a_8 + x^2 a_9 + x y^3 a_10 + x y^2 z a_11 + x y^2 a_12 + x y z^2 a_13 + x y z a_14 + x y a_15 +
x z^3 a_16 + x z^2 a_17 + x z a_18 + x a_19 + y^4 a_20 + y^3 z a_21 + y^3 a_22 + y^2 z^2 a_23 + y^2 z a_24 +
y^2 a_25 + y z^3 a_26 + y z^2 a_27 + y z a_28 + y a_29 + z^4 a_30 + z^3 a_31 + z^2 a_32 + z a_33 + a_34
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`In[2]:= CollectAQuartic@sx + cx * t, sy + cy * t, sz + cz * tD, 9t0, t1, t2, t3, t4=E`

`Out[2]=` 
$$\begin{aligned} & a_{34} + t^4 Ha_0 c_x^4 + a_1 c_x^3 c_y + a_4 c_x^2 c_y^2 + a_{10} c_x c_y^3 + a_{20} c_y^4 + a_2 c_x^3 c_z + a_5 c_x^2 c_y c_z + \\ & a_{11} c_x c_y^2 c_z + a_{21} c_y^3 c_z + a_7 c_x^2 c_z^2 + a_{13} c_x c_y c_z^2 + a_{23} c_y^2 c_z^2 + a_{16} c_x c_z^3 + a_{26} c_y c_z^3 + a_{30} c_z^4 L + \\ & a_{19} s_x + a_9 s_x^2 + a_3 s_x^3 + a_0 s_x^4 + a_{29} s_y + a_{15} s_x s_y + a_6 s_x^2 s_y + a_1 s_x^3 s_y + a_{25} s_y^2 + a_{12} s_x s_y^2 + \\ & a_4 s_x^2 s_y^2 + a_{22} s_y^3 + a_{10} s_x s_y^3 + a_{20} s_y^4 + a_{33} s_z + a_{18} s_x s_z + a_8 s_x^2 s_z + a_2 s_x^3 s_z + a_{28} s_y s_z + \\ & a_{14} s_x s_y s_z + a_5 s_x^2 s_y s_z + a_{24} s_y^2 s_z + a_{11} s_x s_y^2 s_z + a_{21} s_y^3 s_z + a_{32} s_z^2 + a_{17} s_x s_z^2 + \\ & a_7 s_x^2 s_z^2 + a_{27} s_y s_z^2 + a_{13} s_x s_y s_z^2 + a_{23} s_y^2 s_z^2 + a_{31} s_z^3 + a_{16} s_x s_z^3 + a_{26} s_y s_z^3 + a_{30} s_z^4 + \\ & t^3 Ha_3 c_x^3 + a_6 c_x^2 c_y + a_{12} c_x c_y^2 + a_{22} c_y^3 + a_8 c_x^2 c_z + a_{14} c_x c_y c_z + a_{24} c_y^2 c_z + a_{17} c_x c_z^2 + \\ & a_{27} c_y c_z^2 + a_{31} c_z^3 + 4 a_0 c_x^3 s_x + 3 a_1 c_x^2 c_y s_x + 2 a_4 c_x c_y^2 s_x + a_{10} c_y^3 s_x + 3 a_2 c_x^2 c_z s_x + \\ & 2 a_5 c_x c_y c_z s_x + a_{11} c_y^2 c_z s_x + 2 a_7 c_x c_z^2 s_x + a_{13} c_y c_z^2 s_x + a_{16} c_z^3 s_x + a_1 c_x^3 s_y + \\ & 2 a_4 c_x^2 c_y s_y + 3 a_{10} c_x c_y^2 s_y + 4 a_{20} c_y^3 s_y + a_5 c_x^2 c_z s_y + 2 a_{11} c_x c_y c_z s_y + 3 a_{21} c_y^2 c_z s_y + \\ & a_{13} c_x c_z^2 s_y + 2 a_{23} c_y c_z^2 s_y + a_{26} c_z^3 s_y + a_2 c_x^3 s_z + a_5 c_x^2 c_y s_z + a_{11} c_x c_y^2 s_z + a_{21} c_y^3 s_z + \\ & 2 a_7 c_x^2 c_z s_z + 2 a_{13} c_x c_y c_z s_z + 2 a_{23} c_y^2 c_z s_z + 3 a_{16} c_x c_z^2 s_z + 3 a_{26} c_y c_z^2 s_z + 4 a_{30} c_z^3 s_z L + \\ & t^2 Ha_9 c_x^2 + a_{15} c_x c_y + a_{25} c_y^2 + a_{18} c_x c_z + a_{28} c_y c_z + a_{32} c_z^2 + 3 a_3 c_x^2 s_x + 2 a_6 c_x c_y s_x + \\ & a_{12} c_y^2 s_x + 2 a_8 c_x c_z s_x + a_{14} c_y c_z s_x + a_{17} c_z^2 s_x + 6 a_0 c_x^2 s_x^2 + 3 a_1 c_x c_y s_x^2 + a_4 c_y^2 s_x^2 + \\ & 3 a_2 c_x c_z s_x^2 + a_5 c_y c_z s_x^2 + a_7 c_z^2 s_x^2 + a_6 c_x^2 s_y + 2 a_{12} c_x c_y s_y + 3 a_{22} c_y^2 s_y + a_{14} c_x c_z s_y + \\ & 2 a_{24} c_y c_z s_y + a_{27} c_z^2 s_y + 3 a_1 c_x^2 s_x s_y + 4 a_4 c_x c_y s_x s_y + 3 a_{10} c_y^2 s_x s_y + 2 a_5 c_x c_z s_x s_y + \\ & 2 a_{11} c_y c_z s_x s_y + a_{13} c_z^2 s_x s_y + a_4 c_x^2 s_y^2 + 3 a_{10} c_x c_y s_y^2 + 6 a_{20} c_y^2 s_y^2 + a_{11} c_x c_z s_y^2 + \\ & 3 a_{21} c_y c_z s_y^2 + a_{23} c_z^2 s_y^2 + a_8 c_x^2 s_z + a_{14} c_x c_y s_z + a_{24} c_y^2 s_z + 2 a_{17} c_x c_z s_z + 2 a_{27} c_y c_z s_z + \\ & 3 a_{31} c_z^2 s_z + 3 a_2 c_x^2 s_x s_z + 2 a_5 c_x c_y s_x s_z + a_{11} c_y^2 s_x s_z + 4 a_7 c_x c_z s_x s_z + 2 a_{13} c_y c_z s_x s_z + \\ & 3 a_{16} c_z^2 s_x s_z + a_5 c_x^2 s_y s_z + 2 a_{11} c_x c_y s_y s_z + 3 a_{21} c_y^2 s_y s_z + 2 a_{13} c_x c_z s_y s_z + 4 a_{23} c_y c_z s_y s_z + \\ & 3 a_{26} c_z^2 s_y s_z + a_7 c_x^2 s_z^2 + a_{13} c_x c_y s_z^2 + a_{23} c_y^2 s_z^2 + 3 a_{16} c_x c_z s_z^2 + 3 a_{26} c_y c_z s_z^2 + 6 a_{30} c_z^2 s_z^2 L + \\ & t Ha_{19} c_x + a_{29} c_y + a_{33} c_z + 2 a_9 c_x s_x + a_{15} c_y s_x + a_{18} c_z s_x + 3 a_3 c_x s_x^2 + a_6 c_y s_x^2 + a_8 c_z s_x^2 + \\ & 4 a_0 c_x s_x^3 + a_1 c_y s_x^3 + a_2 c_z s_x^3 + a_{15} c_x s_y + 2 a_{25} c_y s_y + a_{28} c_z s_y + 2 a_6 c_x s_x s_y + \\ & 2 a_{12} c_y s_x s_y + a_{14} c_z s_x s_y + 3 a_1 c_x s_x^2 s_y + 2 a_4 c_y s_x^2 s_y + a_5 c_z s_x^2 s_y + a_{12} c_x s_y^2 + \\ & 3 a_{22} c_y s_y^2 + a_{24} c_z s_y^2 + 2 a_4 c_x s_x s_y^2 + 3 a_{10} c_y s_x s_y^2 + a_{11} c_z s_x s_y^2 + a_{10} c_x s_y^3 + 4 a_{20} c_y s_y^3 + \\ & a_{21} c_z s_y^3 + a_{18} c_x s_z + a_{28} c_y s_z + 2 a_{32} c_z s_z + 2 a_8 c_x s_x s_z + a_{14} c_y s_x s_z + 2 a_{17} c_z s_x s_z + \\ & 3 a_2 c_x s_x^2 s_z + a_5 c_y s_x^2 s_z + 2 a_7 c_z s_x^2 s_z + a_{14} c_x s_y s_z + 2 a_{24} c_y s_y s_z + 2 a_{27} c_z s_y s_z + \\ & 2 a_5 c_x s_x s_y s_z + 2 a_{11} c_y s_x s_y s_z + 2 a_{13} c_z s_x s_y s_z + a_{11} c_x s_y^2 s_z + 3 a_{21} c_y s_y^2 s_z + \\ & 2 a_{23} c_z s_y^2 s_z + a_{17} c_x s_z^2 + a_{27} c_y s_z^2 + 3 a_{31} c_z s_z^2 + 2 a_7 c_x s_x s_z^2 + a_{13} c_y s_x s_z^2 + 3 a_{16} c_z s_x s_z^2 + \\ & a_{13} c_x s_y s_z^2 + 2 a_{23} c_y s_y s_z^2 + 3 a_{26} c_z s_y s_z^2 + a_{16} c_x s_z^3 + a_{26} c_y s_z^3 + 4 a_{30} c_z s_z^3 L \end{aligned}$$

`In[3]:= D@Quartic@x, y, zD, xD`

`Out[3]=` 
$$4 x^3 a_0 + 3 x^2 y a_1 + 3 x^2 z a_2 + 3 x^2 a_3 + 2 x y^2 a_4 + 2 x y z a_5 + 2 x y a_6 + 2 x z^2 a_7 + 2 x z a_8 + 2 x a_9 + y^3 a_{10} + y^2 z a_{11} + y^2 a_{12} + y z^2 a_{13} + y z a_{14} + y a_{15} + z^3 a_{16} + z^2 a_{17} + z a_{18} + a_{19}$$

`In[4]:= D@Quartic@x, y, zD, yD`

`Out[4]=` 
$$x^3 a_1 + 2 x^2 y a_4 + x^2 z a_5 + x^2 a_6 + 3 x y^2 a_{10} + 2 x y z a_{11} + 2 x y a_{12} + x z^2 a_{13} + x z a_{14} + x a_{15} + 4 y^3 a_{20} + 3 y^2 z a_{21} + 3 y^2 a_{22} + 2 y z^2 a_{23} + 2 y z a_{24} + 2 y a_{25} + z^3 a_{26} + z^2 a_{27} + z a_{28} + a_{29}$$

`In[5]:= D@Quartic@x, y, zD, zD`

`Out[5]=` 
$$x^3 a_2 + x^2 y a_5 + 2 x^2 z a_7 + x^2 a_8 + x y^2 a_{11} + 2 x y z a_{13} + x y a_{14} + 3 x z^2 a_{16} + 2 x z a_{17} + x a_{18} + y^3 a_{21} + 2 y^2 z a_{23} + y^2 a_{24} + 3 y z^2 a_{26} + 2 y z a_{27} + y a_{28} + 4 z^3 a_{30} + 3 z^2 a_{31} + 2 z a_{32} + a_{33}$$