

```
def main():
    Print_Function()
    (a, b, c) = abc = symbols('a,b,c',real=True)
    (o3d, ea, eb, ec) = Ga.build('e_a e_b e_c', g=[1, 1, 1], coords=abc)
    grad = o3d.grad
    x = symbols('x',real=True)
    A = o3d.lt([[x*a*c**2,x**2*a*b*c,x**2*a**3*b**5],\
                [x**3*a**2*b*c,x**4*a*b**2*c**5,5*x**4*a*b**2*c],\
                [x**4*a*b**2*c**4,4*x**4*a*b**2*c**2,4*x**4*a**5*b**2*c]])

    print 'A =',A
    v = a*ea+b*eb+c*ec
    print 'v =',v
    f = v|A(v)
    print r'%f = v\cdot \f{A}{v} =',f
    (grad * f).Fmt(3,r'%\nabla f')
    Av = A(v)
    print r'%\f{A}{v} =', Av
    (grad * Av).Fmt(3,r'%\nabla \f{A}{v}')
```

Code Output:

$$A = \left\{ \begin{array}{l} L(e_a) = ac \wedge 2xe_a + a \wedge 2bcx \wedge 3e_b + ab \wedge 2c \wedge 4x \wedge 4e_c \\ L(e_b) = abcx \wedge 2e_a + ab \wedge 2c \wedge 5x \wedge 4e_b + 4ab \wedge 2c \wedge 2x \wedge 4e_c \\ L(e_c) = a^3b^5x^2e_a + 5ab^2cx^4e_b + 4a^5b^2cx^4e_c \end{array} \right\}$$
$$v = ae_a + be_b + ce_c$$
$$f = v \cdot A(v) = acx \left(4a^4b^2c^2x^3 + a^3b^5x + a^2b^2x^2 + a^2c + ab^2c^4x^3 + ab^2x + b^4c^4x^3 + 4b^3c^2x^3 + 5b^3cx^3 \right)$$
$$\begin{aligned} \nabla f = & cx \left(20a^4b^2c^2x^3 + 4a^3b^5x + 3a^2b^2x^2 + 3a^2c + 2ab^2c^4x^3 + 2ab^2x + b^4c^4x^3 + 4b^3c^2x^3 + 5b^3cx^3 \right) e_a \\ & + abcx^2 \left(8a^4c^2x^2 + 5a^3b^3 + 2a^2x + 2ac^4x^2 + 2a + 4b^2c^4x^2 + 12bc^2x^2 + 15bcx^2 \right) e_b \\ & + ax \left(12a^4b^2c^2x^3 + a^3b^5x + a^2b^2x^2 + 2a^2c + 5ab^2c^4x^3 + ab^2x + 5b^4c^4x^3 + 12b^3c^2x^3 + 10b^3cx^3 \right) e_c \end{aligned}$$
$$A(v) = acx \left(a^2b^5x + ac + b^2x \right) e_a + abcx^3 \left(a^2 + b^2c^4x + 5bcx \right) e_b + ab^2c^2x^4 \left(4a^4 + ac^2 + 4b \right) e_c$$
$$\begin{aligned} \nabla A(v) = & cx \left(8a^5b^2x^3 + a^3x^2 + 3a^2b^5x + 4a^2b^2c^2x^3 + 8ab^3x^3 + 3ab^2c^4x^3 + 10abcx^3 + 2ac + b^2x \right) \\ & + bcx^2 \left(-5a^3b^3 + 3a^2x - 2a + b^2c^4x^2 + 5bcx^2 \right) e_a \wedge e_b \\ & + x \left(20a^4b^2c^2x^3 - a^3b^5x - 2a^2c + 2ab^2c^4x^3 - ab^2x + 4b^3c^2x^3 \right) e_a \wedge e_c \\ & + abx^3 \left(8a^4c^2x - a^2 + 2ac^4x - 5b^2c^4x + 12bc^2x - 10bcx \right) e_b \wedge e_c \end{aligned}$$