

```
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)
    hline()

    v = a*ea+b*eb+c*ec

    print('v =',v)
    hline()

    f = v|A(v)

    print(r'f = v\cdot \f{A}{v} =',f)
    hline()

    print(r'\nabla f =',(grad * f).Fmt(3))
    hline()

    Av = A(v)

    print(r'\f{A}{v} =', Av)
    hline()

    print(r'\nabla \f{A}{v} =',(grad * Av).Fmt(3))
    hline()

    return
```

Code Output:

$$A = \left\{ \begin{array}{l} L(e_a) = ac^2xe_a + abcx^2e_b + a^3b^5x^2e_c \\ L(e_b) = a^2bcx^3e_a + ab^2c^5x^4e_b + 5ab^2cx^4e_c \\ L(e_c) = ab^2c^4x^4e_a + 4ab^2c^2x^4e_b + 4a^5b^2cx^4e_c \end{array} \right\}$$

$$v = ae_a + be_b + ce_c$$

$$f = v \cdot A(v) = acx \left(4a^4b^2c^2x^3 + a^3b^5x + a^2b^2x^2 + a^2c + ab^2c^4x^3 + ab^2x + b^4c^4x^3 + 4b^3c^2x^3 + 5b^3cx^3 \right)$$

$$\begin{aligned} \nabla f = & cx \left(20a^4b^2c^2x^3 + 4a^3b^5x + 3a^2b^2x^2 + 3a^2c + 2ab^2c^4x^3 + 2ab^2x + b^4c^4x^3 + 4b^3c^2x^3 + 5b^3cx^3 \right) e_a \\ & + abcx^2 \left(8a^4c^2x^2 + 5a^3b^3 + 2a^2x + 2ac^4x^2 + 2a + 4b^2c^4x^2 + 12bc^2x^2 + 15bcx^2 \right) e_b \\ & + ax \left(12a^4b^2c^2x^3 + a^3b^5x + a^2b^2x^2 + 2a^2c + 5ab^2c^4x^3 + ab^2x + 5b^4c^4x^3 + 12b^3c^2x^3 + 10b^3cx^3 \right) e_c \end{aligned}$$

$$\begin{aligned} A(v) = & acx \left(ab^2x^2 + ac + b^2c^4x^3 \right) e_a \\ & + abcx^2 \left(a + b^2c^4x^2 + 4bc^2x^2 \right) e_b \\ & + ab^2x^2 \left(4a^4c^2x^2 + a^3b^3 + 5bcx^2 \right) e_c \end{aligned}$$

$$\begin{aligned}
\nabla A(v) = & \quad x \left(8a^5b^2cx^3 + a^2cx + 5ab^3x^3 + 3ab^2c^5x^3 + 2ab^2cx^2 + 8abc^3x^3 + 2ac^2 + b^2c^5x^3 \right) \\
& + bcx^2 \left(-2a^2x - 2ac^4x^2 + 2a + b^2c^4x^2 + 4bc^2x^2 \right) \mathbf{e}_a \wedge \mathbf{e}_b \\
& + x \left(20a^4b^2c^2x^3 + 4a^3b^5x - a^2b^2x^2 - 2a^2c - 5ab^2c^4x^3 + 5b^3cx^3 \right) \mathbf{e}_a \wedge \mathbf{e}_c \\
& + abx^2 \left(8a^4c^2x^2 + 5a^3b^3 - a - 5b^2c^4x^2 - 12bc^2x^2 + 15bcx^2 \right) \mathbf{e}_b \wedge \mathbf{e}_c
\end{aligned}$$
