$$g = \begin{bmatrix} (e_1 \cdot e_1) & (e_1 \cdot e_2) & (e_1 \cdot e_3) \\ (e_1 \cdot e_2) & (e_2 \cdot e_2) & (e_2 \cdot e_3) \\ (e_1 \cdot e_3) & (e_2 \cdot e_3) & (e_3 \cdot e_3) \end{bmatrix}$$

$$a = a^1\boldsymbol{e}_1 + a^2\boldsymbol{e}_2 + a^3\boldsymbol{e}_3$$

$$b = b^1\boldsymbol{e}_1 + b^2\boldsymbol{e}_2 + b^3\boldsymbol{e}_3$$

$$c = c^1\boldsymbol{e}_1 + c^2\boldsymbol{e}_2 + c^3\boldsymbol{e}_3$$

$$I = \frac{1}{\sqrt{(e_1 \cdot e_1)(e_2 \cdot e_2)(e_3 \cdot e_3) - (e_1 \cdot e_1)(e_2 \cdot e_3)^2 - (e_1 \cdot e_2)^2(e_3 \cdot e_3) + 2(e_1 \cdot e_2)(e_1 \cdot e_3)(e_2 \cdot e_3) - (e_1 \cdot e_3)^2(e_2 \cdot e_2)}}\boldsymbol{e}_1 \wedge \boldsymbol{e}_2 \wedge \boldsymbol{e}_3$$

$$(e_1 \wedge e_2 \wedge e_3)^2 = -(e_1 \cdot e_1)(e_2 \cdot e_2)(e_3 \cdot e_3) + (e_1 \cdot e_1)(e_2 \cdot e_3)^2 + (e_1 \cdot e_2)^2(e_3 \cdot e_3) - 2(e_1 \cdot e_2)(e_1 \cdot e_3)(e_2 \cdot e_3) + (e_1 \cdot e_3)^2(e_2 \cdot e_2)$$

$$\Big(-(e_1 \cdot e_2)(e_2 \cdot e_3)b^1c^2 + (e_1 \cdot e_2)(e_2 \cdot e_3)b^2c^1 - (e_1 \cdot e_2)(e_3 \cdot e_3)b^1c^3 + (e_1 \cdot e_2)(e_3 \cdot e_3)b^3c^1 + (e_1 \cdot e_3)(e_2 \cdot e_2)b^1c^2 - (e_1 \cdot e_3)(e_2 \cdot e_2)b^2c^1 + (e_1 \cdot e_3)(e_2 \cdot e_3)b^1c^3 - (e_1 \cdot e_3)(e_2 \cdot e_3)b^3c^1 - (e_2 \cdot e_2)(e_3 \cdot e_3)b^2c^3 + (e_2 \cdot e_2)(e_3 \cdot e_3)b^3c^2 + (e_2 \cdot e_3)^2b^2c^3 - (e_2 \cdot e_3)^2b^3c^2\Big)\boldsymbol{e}_1$$

$$(e_1 \wedge e_2 \wedge e_3)(b \wedge c) = +\Big((e_1 \cdot e_1)(e_2 \cdot e_3)b^1c^2 - (e_1 \cdot e_1)(e_2 \cdot e_3)b^2c^1 + (e_1 \cdot e_1)(e_3 \cdot e_3)b^1c^3 - (e_1 \cdot e_1)(e_3 \cdot e_3)b^3c^1 - (e_1 \cdot e_2)(e_1 \cdot e_3)b^1c^2 + (e_1 \cdot e_2)(e_1 \cdot e_3)b^2c^1 + (e_1 \cdot e_2)(e_3 \cdot e_3)b^2c^3 - (e_1 \cdot e_2)(e_3 \cdot e_3)b^3c^2 - (e_1 \cdot e_3)^2b^1c^3 + (e_1 \cdot e_3)^2b^3c^1 - (e_1 \cdot e_3)(e_2 \cdot e_3)b^2c^3 + (e_1 \cdot e_3)(e_2 \cdot e_3)b^3c^2\Big)\boldsymbol{e}_2$$

$$+\Big(-(e_1 \cdot e_1)(e_2 \cdot e_2)b^1c^2 + (e_1 \cdot e_1)(e_2 \cdot e_2)b^2c^1 - (e_1 \cdot e_1)(e_2 \cdot e_3)b^1c^3 + (e_1 \cdot e_1)(e_2 \cdot e_3)b^3c^1 + (e_1 \cdot e_2)^2b^1c^2 - (e_1 \cdot e_2)^2b^2c^1 + (e_1 \cdot e_2)(e_1 \cdot e_3)b^1c^3 - (e_1 \cdot e_2)(e_1 \cdot e_3)b^3c^1 - (e_1 \cdot e_2)(e_2 \cdot e_3)b^2c^3 + (e_1 \cdot e_2)(e_2 \cdot e_3)b^3c^2 + (e_1 \cdot e_3)(e_2 \cdot e_2)b^2c^3 - (e_1 \cdot e_3)(e_2 \cdot e_2)b^3c^2\Big)\boldsymbol{e}_3$$

$$\Big((e_1 \cdot e_1)(e_2 \cdot e_3)a^1b^1c^2 - (e_1 \cdot e_1)(e_2 \cdot e_3)a^1b^2c^1 + (e_1 \cdot e_1)(e_3 \cdot e_3)a^1b^1c^3 - (e_1 \cdot e_1)(e_3 \cdot e_3)a^1b^3c^1 - (e_1 \cdot e_2)(e_1 \cdot e_3)a^1b^1c^2 + (e_1 \cdot e_2)(e_1 \cdot e_3)a^1b^2c^1 + (e_1 \cdot e_2)(e_2 \cdot e_3)a^2b^1c^2 - (e_1 \cdot e_2)(e_2 \cdot e_3)a^2b^2c^1 + (e_1 \cdot e_2)(e_3 \cdot e_3)a^1b^2c^3 - (e_1 \cdot e_2)(e_3 \cdot e_3)a^1b^3c^2 + (e_1 \cdot e_2)(e_3 \cdot e_3)a^2b^1c^3 - (e_1 \cdot e_2)(e_3 \cdot e_3)a^2b^3c^1 - (e_1 \cdot e_3)^2a^1b^1c^3 + (e_1 \cdot e_3)^2a^1b^3c^1 - (e_1 \cdot e_3)(e_2 \cdot e_2)a^2b^1c^2 + (e_1 \cdot e_3)(e_2 \cdot e_2)a^2b^2c^1 - (e_1 \cdot e_3)(e_2 \cdot e_3)a^1b^2c^3 + (e_1 \cdot e_3)(e_2 \cdot e_3)a^1b^3c^2 - (e_1 \cdot e_3)(e_2 \cdot e_3)a^2b^1c^3 +$$

$$a \wedge ((e_1 \wedge e_2 \wedge e_3)(b \wedge c)) = +\Big(-(e_1 \cdot e_1)(e_2 \cdot e_2)a^1b^1c^2 + (e_1 \cdot e_1)(e_2 \cdot e_2)a^1b^2c^1 - (e_1 \cdot e_1)(e_2 \cdot e_3)a^1b^1c^3 + (e_1 \cdot e_1)(e_2 \cdot e_3)a^1b^3c^1 + (e_1 \cdot e_2)^2a^1b^1c^2 - (e_1 \cdot e_2)^2a^1b^2c^1 + (e_1 \cdot e_2)(e_1 \cdot e_3)a^1b^1c^3 - (e_1 \cdot e_2)(e_1 \cdot e_3)a^1b^3c^1 - (e_1 \cdot e_2)(e_2 \cdot e_3)a^1b^2c^3 + (e_1 \cdot e_2)(e_2 \cdot e_3)a^1b^3c^2 + (e_1 \cdot e_2)(e_2 \cdot e_3)a^3b^1c^2 - (e_1 \cdot e_2)(e_2 \cdot e_3)a^3b^2c^1 + (e_1 \cdot e_2)(e_3 \cdot e_3)a^3b^1c^3 - (e_1 \cdot e_2)(e_3 \cdot e_3)a^3b^3c^1 + (e_1 \cdot e_3)(e_2 \cdot e_2)a^1b^2c^3 - (e_1 \cdot e_3)(e_2 \cdot e_2)a^1b^3c^2 - (e_1 \cdot e_3)(e_2 \cdot e_2)a^3b^1c^2 + (e_1 \cdot e_3)(e_2 \cdot e_2)a^3b^2c^1 - (e_1 \cdot e_3)(e_2 \cdot e_3)$$

$$+\Big(-(e_1 \cdot e_1)(e_2 \cdot e_2)a^2b^1c^2 + (e_1 \cdot e_1)(e_2 \cdot e_2)a^2b^2c^1 - (e_1 \cdot e_1)(e_2 \cdot e_3)a^2b^1c^3 + (e_1 \cdot e_1)(e_2 \cdot e_3)a^2b^3c^1 - (e_1 \cdot e_1)(e_2 \cdot e_3)a^3b^1c^2 + (e_1 \cdot e_1)(e_2 \cdot e_3)a^3b^2c^1 - (e_1 \cdot e_1)(e_3 \cdot e_3)a^3b^1c^3 + (e_1 \cdot e_1)(e_3 \cdot e_3)a^3b^3c^1 + (e_1 \cdot e_2)^2a^2b^1c^2 - (e_1 \cdot e_2)^2a^2b^2c^1 + (e_1 \cdot e_2)(e_1 \cdot e_3)a^2b^1c^3 - (e_1 \cdot e_2)(e_1 \cdot e_3)a^2b^3c^1 + (e_1 \cdot e_2)(e_1 \cdot e_3)a^3b^1c^2 - (e_1 \cdot e_2)(e_1 \cdot e_3)a^3b^2c^1 - (e_1 \cdot e_2)(e_2 \cdot e_3)a^2b^2c^3 + (e_1 \cdot e_2)(e_2 \cdot e_3)a^2b^3c^2 - (e_1 \cdot e_2)(e_3 \cdot e_3)a^3b^2c^3 + (e_1 \cdot e_2)(e_3 \cdot e_3)a^3b^3c^2 + (e_1 \cdot e_3)^2a^3b^1c^3 -$$

$$\Big((e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^1b^1c^2 - (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^1b^2c^1 - (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_3)^2a^1b^1c^2 + (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_3)^2a^1b^2c^1 + (e_1 \cdot e_1)(e_1 \cdot e_3)(e_2 \cdot e_2)(e_3 \cdot e_3)a^1b^1c^3 - (e_1 \cdot e_1)(e_1 \cdot e_3)(e_2 \cdot e_2)(e_3 \cdot e_3)a^1b^3c^1 - (e_1 \cdot e_1)(e_1 \cdot e_3)(e_2 \cdot e_3)^2a^1b^1c^3 + (e_1 \cdot e_1)(e_1 \cdot e_3)(e_2 \cdot e_3)^2a^1b^3c^1 + (e_1 \cdot e_1)(e_3 \cdot e_3)(e_2 \cdot e_2)^2a^2b^1c^2 - (e_1 \cdot e_1)(e_3 \cdot e_3)(e_2 \cdot e_2)^2a^2b^2c^1 - (e_1 \cdot e_1)(e_2 \cdot e_2)(e_2 \cdot e_3)^2a^2b^1c^2 + (e_1 \cdot e_1)(e_2 \cdot e_2)(e_2 \cdot e_3)^2a^2b^2c^1 +$$

$$(e_1 \wedge e_2 \wedge e_3)(a \wedge ((e_1 \wedge e_2 \wedge e_3)(b \wedge c))) = +\Big(-(e_2 \cdot e_2)(e_3 \cdot e_3)(e_1 \cdot e_1)^2a^1b^1c^2 + (e_2 \cdot e_2)(e_3 \cdot e_3)(e_1 \cdot e_1)^2a^1b^2c^1 + (e_2 \cdot e_3)^2(e_1 \cdot e_1)^2a^1b^1c^2 - (e_2 \cdot e_3)^2(e_1 \cdot e_1)^2a^1b^2c^1 + (e_1 \cdot e_1)(e_1 \cdot e_2)^2(e_3 \cdot e_3)a^1b^1c^2 - (e_1 \cdot e_1)(e_1 \cdot e_2)^2(e_3 \cdot e_3)a^1b^2c^1 - 2(e_1 \cdot e_1)(e_1 \cdot e_2)(e_1 \cdot e_3)(e_2 \cdot e_3)a^1b^1c^2 + 2(e_1 \cdot e_1)(e_1 \cdot e_2)(e_1 \cdot e_3)(e_2 \cdot e_3)a^1b^2c^1 - (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^2b^1c^2 + (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^2b^2c^1 + (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_3)^2a^2b^1c^2 - (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_3)^2a^2b^2c^1 + (e_1 \cdot e_1)(e_1 \cdot e_3)^2$$

$$+\Big(-(e_2 \cdot e_2)(e_3 \cdot e_3)(e_1 \cdot e_1)^2a^1b^1c^3 + (e_2 \cdot e_2)(e_3 \cdot e_3)(e_1 \cdot e_1)^2a^1b^3c^1 + (e_2 \cdot e_3)^2(e_1 \cdot e_1)^2a^1b^1c^3 - (e_2 \cdot e_3)^2(e_1 \cdot e_1)^2a^1b^3c^1 + (e_1 \cdot e_1)(e_1 \cdot e_2)^2(e_3 \cdot e_3)a^1b^1c^3 - (e_1 \cdot e_1)(e_1 \cdot e_2)^2(e_3 \cdot e_3)a^1b^3c^1 - 2(e_1 \cdot e_1)(e_1 \cdot e_2)(e_1 \cdot e_3)(e_2 \cdot e_3)a^1b^1c^3 + 2(e_1 \cdot e_1)(e_1 \cdot e_2)(e_1 \cdot e_3)(e_2 \cdot e_3)a^1b^3c^1 - (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^1b^2c^3 + (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^1b^3c^2 - (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^2b^1c^3 + (e_1 \cdot e_1)(e_1 \cdot e_2)(e_2 \cdot e_2)(e_3 \cdot e_3)a^2b^3c^1 +$$