$cu + i \cdot z1su + j \cdot z2su + k \cdot z3su$

 $cv + i \cdot y1sv + j \cdot y2sv + k \cdot y3sv$

 $cw + i \cdot x1sw + j \cdot x2sw + k \cdot x3sw$

 $(cu+i\cdot z1su+j\cdot z2su+k\cdot z3su)\cdot (cv+i\cdot y1sv+j\cdot y2sv+k\cdot y3sv)\cdot (cw+i\cdot x1sw+j\cdot x2sw+k\cdot x3sw) \ simplify \ \rightarrow (cw+i\cdot x1sw+j\cdot x2sw+k\cdot x3sw)\cdot (cv+i\cdot y1sv+j\cdot y2sv+k\cdot y3sv)\cdot (cu+i\cdot z1su+j\cdot z2su+k\cdot z3su)$

 $(cu+i\cdot z1su+j\cdot z2su+k\cdot z3su)\cdot (cv+i\cdot y1sv+j\cdot y2sv+k\cdot y3sv)\cdot (cw+i\cdot x1sw+j\cdot x2sw+k\cdot x3sw) \rightarrow (cw+i\cdot x1sw+j\cdot x2sw+k\cdot x3sw)\cdot (cv+i\cdot y1sv+j\cdot y2sv+k\cdot y3sv)\cdot (cu+i\cdot z1su+j\cdot z2su+k\cdot z3su)$

 $(cu+i\cdot z1su+j\cdot z2su+k\cdot z3su)\cdot (cv+i\cdot y1sv+j\cdot y2sv+k\cdot y3sv) \text{ expand } \rightarrow cu\cdot cv+cu\cdot i\cdot y1sv+cv\cdot i\cdot z1su+cu\cdot j\cdot y2sv+cv\cdot j\cdot z2su+cu\cdot k\cdot y3sv+cv\cdot k\cdot z3su+i^2\cdot y1sv\cdot z2su+i\cdot j\cdot y1sv\cdot z2su+i\cdot j\cdot y1sv\cdot z2su+i\cdot j\cdot y2sv\cdot z2su+i\cdot j\cdot$

 $cu\cdot cv + cu\cdot i\cdot y1sv + cv\cdot i\cdot z1su + cu\cdot j\cdot y2sv + cv\cdot j\cdot z2su + cu\cdot k\cdot y3sv + cv\cdot k\cdot z3su + i^2\cdot y1sv\cdot z1su + j^2\cdot y2sv\cdot z2su + k^2\cdot y3sv\cdot z2su + k\cdot y2sv\cdot z2su + k\cdot y2sv\cdot z1su + j\cdot y1sv\cdot z3su + -j\cdot y3sv\cdot z1su + -j\cdot y3sv\cdot z2su + i\cdot y3sv\cdot z2su + i^2\cdot y2sv\cdot z2su + k^2\cdot y3sv\cdot z2su + k\cdot y2sv\cdot z2su + k\cdot y2sv\cdot z2su + j\cdot y1sv\cdot z3su + -j\cdot y3sv\cdot z2su + i\cdot y3sv\cdot z2su + i^2\cdot y2sv\cdot z2su + i^2\cdot y2s$

 $cu\cdot cv + cu\cdot i\cdot y1sv + cv\cdot i\cdot z1su + cu\cdot j\cdot y2sv + cv\cdot j\cdot z2su + cu\cdot k\cdot y3sv + cv\cdot z2su + y1sv\cdot z2su + y1sv\cdot z2su + y1sv\cdot z2su + y2sv\cdot z2su + y1sv\cdot z2su + y2sv\cdot z2su + y2sv$

 $[(\text{cu-y1sv} + \text{cv-z1su} - \text{y2sv-z3su} + \text{y3sv-z2su}) \cdot \text{i} + (\text{cu-y2sv} + \text{cv-z2su} + \text{y1sv-z3su} - \text{y3sv-z2su}) \cdot \text{j} + (\text{cu-y3sv} + \text{cv-z2su} + \text{y1sv-z3su} - \text{y3sv-z2su}) \cdot \text{j} + (\text{cu-y3sv} + \text{cv-z2su} + \text{y1sv-z3su} - \text{y3sv-z2su} + \text{cu-i}^2 \cdot \text{x2sw-y3sv-z2su} - \text{cw-y3sv-z2su} + \text{cu-i}^2 \cdot \text{x2sw-y3sv-z2su} - \text{cw-y3sv-z2su} + \text{cu-i}^2 \cdot \text{x2sw-y3sv-z2su} - \text{y3sv-z2su} + \text{cu-i}^2 \cdot \text{x2sw-y3sv-z2su} + \text{cu-i}^2 \cdot \text{x2sw-y3sv-z2su} + \text{i}^2 \cdot \text{x2$

 $D \cdot cw + D \cdot i \cdot x1sw + D \cdot j \cdot x2sw + D \cdot k \cdot x3sw + A \cdot i^2 \cdot x1sw + B \cdot j^2 \cdot x2sw + C \cdot k^2 \cdot x3sw + A \cdot cw \cdot i + B \cdot cw \cdot j + C \cdot cw \cdot k + A \cdot k \cdot x2sw + B \cdot -k \cdot x1sw + A \cdot -j \cdot x3sw + C \cdot j \cdot x1sw + B \cdot i \cdot x3sw + C \cdot -i \cdot x2sw + C \cdot k^2 \cdot x3sw + C \cdot k$

 $D \cdot cw + D \cdot i \cdot x \\ 1sw + D \cdot j \cdot x \\ 2sw + D \cdot k \cdot x \\ 3sw + A \cdot -1 \cdot x \\ 1sw + B \cdot -1 \cdot x \\ 2sw + C \cdot -1 \cdot x \\ 3sw + C \cdot -i \cdot x \\ 2sw + D \cdot x \\ 1sw + B \cdot -i \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 1sw + D \cdot x \\ 2sw + D \cdot x \\ 2s$

 $(A \cdot cw + B \cdot x3sw - C \cdot x2sw + D \cdot x1sw) \cdot i + (B \cdot cw - A \cdot x3sw + C \cdot x1sw + D \cdot x2sw) \cdot j + (C \cdot cw + A \cdot x2sw - B \cdot x1sw + D \cdot x3sw) \cdot k + D \cdot cw - A \cdot x1sw + D \cdot x2sw + D \cdot x3sw +$

- $(cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su) + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su + y1sv\cdot z2su + y2sv\cdot z1su) + x3sw\cdot (cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z2su + y2sv\cdot z1su) + x3sw\cdot (cu\cdot y2sv + cv\cdot z2su + y2sv\cdot z2su +$
- $(cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z3su y3sv\cdot z1su)\cdot cw (cu\cdot y1sv + cv\cdot z2su + y2sv\cdot z2su + y2sv\cdot z2su y2sv\cdot z2su + y2sv$
- $(cu\cdot y3sv + cv\cdot z3su y1sv\cdot z2su + y2sv\cdot z1su) \cdot cw + (cu\cdot y1sv + cv\cdot z2su + y2sv\cdot z2su + y2s$
- $(cu\cdot cv y1sv\cdot z1su y2sv\cdot z2su y3sv\cdot z3su)\cdot cw (cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su)\cdot x1sw \ collect, su, sv, sw \ \rightarrow -cw\cdot (y1sv\cdot z1su cu\cdot cv + y2sv\cdot z2su + y3sv\cdot z2su) x1sw\cdot (cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su)$
- $i \qquad cw\cdot (cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su) x1sw\cdot (y1sv\cdot z1su cu\cdot cv + y2sv\cdot z2su + y3sv\cdot z3su) x2sw\cdot (cu\cdot y3sv + cv\cdot z3su y1sv\cdot z2su + y2sv\cdot z1su) + x3sw\cdot (cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z3su y3sv\cdot z1su) + x3sw\cdot (cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z3su y1sv\cdot z2su + y2sv\cdot z1su) + x3sw\cdot (cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z3su y1sv\cdot z2su + y2sv\cdot z1su) + x3sw\cdot (cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z2su +$
- $cw\cdot(cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z3su y3sv\cdot z1su) + x1sw\cdot(cu\cdot y3sv + cv\cdot z3su y1sv\cdot z2su + y2sv\cdot z1su) x2sw\cdot(y1sv\cdot z1su cu\cdot cv + y2sv\cdot z2su + y3sv\cdot z3su) x3sw\cdot(cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su)$
- $k \qquad cw\cdot (cu\cdot y3sv + cv\cdot z3su y1sv\cdot z2su + y2sv\cdot z1su) x1sw\cdot (cu\cdot y2sv + cv\cdot z2su + y1sv\cdot z3su y3sv\cdot z1su) + x2sw\cdot (cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su) x3sw\cdot (y1sv\cdot z1su cu\cdot cv + y2sv\cdot z2su + y3sv\cdot z2su) + x2sw\cdot (z1su z1su z1su) + x2sw\cdot (z1su z1su z1su) + x2sw\cdot (z1su z1su z1su) + x2sw\cdot (z1su z1su) + x2sw\cdot (z1su$
- $\\ 0 \qquad \left[-cw\cdot (y1sv\cdot z1su cu\cdot cv + y2sv\cdot z2su + y3sv\cdot z3su) x1sw\cdot (cu\cdot y1sv + cv\cdot z1su y2sv\cdot z3su + y3sv\cdot z2su) \right]$



