

$$U(p_1, q_1) \times U(q_1, p_1)$$

U)

$$U(p_1, q_1)$$

$$\times U(p_2, q_2)$$

U)

$$U(p_2) \times U(q_2)$$

$$(\alpha \ 0 \ \beta)$$

$$(\gamma \ 0 \ \delta)$$

$$+ \left(\frac{p_1 - q_1}{2} \right)$$

$$+ \left(\frac{q_1 - p_1}{2} \right)$$



$$(\alpha) \otimes (\beta)$$

$$(\gamma) \otimes (\delta)$$

$$+ \left(\frac{p_2}{2} \right) \otimes \left(-\frac{p_2}{2} \right)$$

$$+ \left(+\frac{q_2}{2} \right) \otimes \left(-\frac{q_2}{2} \right)$$

$$\left(\alpha + \frac{p_2}{2} \right) \otimes \left(\delta - \frac{q_2}{2} \right) \geq (r)$$

$$(\alpha) \otimes (\delta) \geq \left(r + \frac{q_2 - p_2}{2} \right)$$

$$\left(\beta - \frac{p_2}{2} \right) \otimes \left(\gamma + \frac{q_2}{2} \right) \geq (r)$$

$$(\beta) \otimes (\gamma) \geq \left(r + \frac{p_2 - q_2}{2} \right)$$

CASES:

$$r + \frac{q_2 - p_2}{2} \geq 0$$

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$$r + \frac{q_2 - p_2}{2} \leq 0$$

$$r + \frac{p_2 - q_2}{2} \leq 0$$

$$r=0 \quad \frac{p_2 - q_2}{2} \geq 0$$

$$\alpha = a + \frac{q_2 - p_2}{2}$$

$$\delta = -a \leq 0$$

$$\gamma = b \geq 0$$

$$\beta = -b = \frac{q_2 - p_2}{2}$$

$$\begin{array}{cccc} \underbrace{P_1} & & \underbrace{Q_1} & \underbrace{Q_1} & \underbrace{-2-} \\ & & & & P_1 \\ \left(\frac{P_1 - Q_1}{2} + \frac{Q_2 - P_2}{2} + a, \frac{P_1 - Q_1}{2}, \frac{P_1 - Q_1}{2} - \frac{Q_2 - P_2}{2} - b \right) \otimes \left(\frac{Q_1 - P_1}{2} + b, \frac{Q_1 - P_1}{2}, \frac{Q_1 - P_1}{2} - a \right) \end{array}$$

$$\updownarrow \left(a + \frac{Q_2 - P_2}{2} \right) \otimes \left(-\frac{Q_2 - P_2}{2} - b \right) \boxtimes (b) \otimes (-a)$$

$$+ \left(\frac{P_2}{2} \right) \otimes \left(-\frac{P_2}{2} \right) \boxtimes \left(\frac{Q_2}{2} \right) \otimes \left(-\frac{Q_2}{2} \right)$$

$$U(p_2, q_2) \times U(q_2, p_2)$$

$$U(p_2, q_2) \times U(p_3, q_3)$$

$$U(p_3) \times U(q_3)$$

$$u(p_3)\text{-type} \quad \begin{matrix} p_2 & q_2 \\ (\alpha_1 & 0 & \beta_1) \\ + & \left(\frac{p_2 - q_2}{2} \right) \end{matrix} \quad \begin{matrix} q_2 & p_2 \\ (\gamma_1 & 0 & \delta_1) \\ + & \left(\frac{q_2 - p_2}{2} \right) \end{matrix} \quad u(q_3)\text{-type}$$

$$\begin{matrix} \updownarrow \\ (\alpha_1) \otimes (\beta_1) \\ + \left(\frac{p_3}{2} \right) \otimes \left(-\frac{p_3}{2} \right) \end{matrix} \quad \begin{matrix} \updownarrow \\ (\gamma_1) \otimes (\delta_1) \\ + \left(\frac{q_3}{2} \right) \otimes \left(-\frac{q_3}{2} \right) \end{matrix}$$

$$(\alpha_1 + \frac{p_3}{2}) \otimes (\delta_1 - \frac{q_3}{2}) \geq (\frac{p_1 - q_1}{2} + \frac{q_2 - p_2}{2} + a, \frac{p_1 - q_1}{2}, \frac{p_1 - q_1}{2} - \frac{q_2 - p_2}{2} - b)$$

$$(\gamma_1 + \frac{q_3}{2}) \otimes (\beta_1 - \frac{p_3}{2}) \geq (\frac{q_1 - p_1}{2} + b, \frac{q_1 - p_1}{2}, \frac{q_1 - p_1}{2} - a)$$

$$\begin{matrix} \geq 0 \\ (\alpha_1) \otimes (\delta_1) \geq \left(\frac{p_1 - q_1}{2} + \frac{q_2 - p_2}{2} + \frac{q_2 - p_2}{2} + a, \frac{p_1 - q_1}{2} + \frac{q_2 - p_2}{2}, \frac{p_1 - q_1}{2} + \frac{q_2 - p_2}{2} - b \right) \end{matrix}$$

$$\begin{matrix} \geq 0 \\ (\gamma_1) \otimes (\beta_1) \geq \left(\frac{q_1 - p_1}{2} + \frac{p_3 - q_3}{2} + b, \frac{q_1 - p_1}{2} + \frac{p_3 - q_3}{2}, \frac{q_1 - p_1}{2} + \frac{p_3 - q_3}{2} - a \right) \end{matrix}$$

Need: (α_1)

$$\begin{matrix} \cancel{p_1 + q_2 - p_1 - q_1} \\ (\beta_1) \end{matrix} \quad \begin{matrix} q_3 - p_2 - q_2 + p_1 + q_1 \end{matrix}$$

$$p_2 + q_2 - p_1 - q_1 \leq p_3$$

$$p_3 = p_2 + q_2 + p_1 + q_1$$