

$$\text{In[*]} := \mathbf{am}_{1,2 \rightarrow 3}$$

$$\text{Out[*]} := \mathbb{E}_{\{1,2\} \rightarrow \{3\}} \left[\mathbf{a}_3 (\alpha_1 + \alpha_2), \mathbf{x}_3 (e^{-\gamma \alpha_2} \xi_1 + \xi_2), \mathbf{1} \right]$$

$$\text{In[*]} := \mathbf{bm}_{1,2 \rightarrow 3}$$

$$\text{Out[*]} := \mathbb{E}_{\{1,2\} \rightarrow \{3\}} \left[\mathbf{b}_3 (\beta_1 + \beta_2), \mathbf{y}_3 (\eta_1 + \eta_2), \mathbf{1} - \mathbf{y}_3 \beta_1 \eta_2 \epsilon + \frac{1}{2} (\mathbf{y}_3 \beta_1^2 \eta_2 + \mathbf{y}_3^2 \beta_1^2 \eta_2^2) \epsilon^2 + \mathbf{O}[\epsilon]^3 \right]$$

$$\text{In[*]} := \mathbf{a}\Delta_{1 \rightarrow 2,3}$$

$$\begin{aligned} \text{Out[*]} := \mathbb{E}_{\{1\} \rightarrow \{2,3\}} & \left[\mathbf{a}_2 \alpha_1 + \mathbf{a}_3 \alpha_1, \mathbf{x}_2 \xi_1 + \mathbf{x}_3 \xi_1, \right. \\ & \mathbf{1} + \frac{1}{2} (-2 \hbar \mathbf{a}_2 \mathbf{x}_3 \xi_1 + \gamma \hbar \mathbf{x}_2 \mathbf{x}_3 \xi_1^2) \epsilon + \frac{1}{24} (12 \hbar^2 \mathbf{a}_2^2 \mathbf{x}_3 \xi_1 + 6 \gamma^2 \hbar^2 \mathbf{x}_2 \mathbf{x}_3 \xi_1^2 - 12 \gamma \hbar^2 \mathbf{a}_2 \mathbf{x}_2 \mathbf{x}_3 \xi_1^2 + \\ & \left. 12 \hbar^2 \mathbf{a}_2^2 \mathbf{x}_3^2 \xi_1^2 + 4 \gamma^2 \hbar^2 \mathbf{x}_2^2 \mathbf{x}_3 \xi_1^3 + 4 \gamma^2 \hbar^2 \mathbf{x}_2 \mathbf{x}_3^2 \xi_1^3 - 12 \gamma \hbar^2 \mathbf{a}_2 \mathbf{x}_2 \mathbf{x}_3^2 \xi_1^3 + 3 \gamma^2 \hbar^2 \mathbf{x}_2^2 \mathbf{x}_3^2 \xi_1^4) \epsilon^2 + \mathbf{O}[\epsilon]^3 \right] \end{aligned}$$

$$\text{In[*]} := \mathbf{b}\Delta_{1 \rightarrow 2,3}$$

$$\begin{aligned} \text{Out[*]} := \mathbb{E}_{\{1\} \rightarrow \{2,3\}} & \left[\mathbf{b}_2 \beta_1 + \mathbf{b}_3 \beta_1, \mathbf{B}_3 \mathbf{y}_2 \eta_1 + \mathbf{y}_3 \eta_1, \mathbf{1} + \frac{1}{2} \gamma \hbar \mathbf{B}_3 \mathbf{y}_2 \mathbf{y}_3 \eta_1^2 \epsilon + \right. \\ & \left. \frac{1}{24} (6 \gamma^2 \hbar^2 \mathbf{B}_3 \mathbf{y}_2 \mathbf{y}_3 \eta_1^2 + 4 \gamma^2 \hbar^2 \mathbf{B}_3^2 \mathbf{y}_2^2 \mathbf{y}_3 \eta_1^3 + 4 \gamma^2 \hbar^2 \mathbf{B}_3 \mathbf{y}_2 \mathbf{y}_3^2 \eta_1^3 + 3 \gamma^2 \hbar^2 \mathbf{B}_3^2 \mathbf{y}_2^2 \mathbf{y}_3^2 \eta_1^4) \epsilon^2 + \mathbf{O}[\epsilon]^3 \right] \end{aligned}$$

$$In[*]:= \left(\mathbf{E}_{\{i,j\} \rightarrow \{i,j\}} [\beta_i \mathbf{b}_i + \alpha_j \mathbf{a}_j, \eta_i \mathbf{y}_i + \xi_j \mathbf{x}_j, \mathbf{1}] \left(\mathbf{a}_{\Delta_{i \rightarrow 1,2}} // \mathbf{a}_{\Delta_{2 \rightarrow 2,3}} // \overline{\mathbf{a}}_{\mathbf{S}_3} \right) \left(\mathbf{b}_{\Delta_{j \rightarrow -1,-2}} // \mathbf{b}_{\Delta_{-2 \rightarrow -2,-3}} \right) // \left(\mathbf{P}_{-1,3} \mathbf{P}_{-3,1} \mathbf{a}_{m_{2,j \rightarrow k}} \mathbf{b}_{m_{i,-2 \rightarrow k}} \right) \right) //$$

$$Out[*]:= \mathbf{E}_{\{i,j\} \rightarrow \{k\}} \left[\mathbf{a}_k \alpha_i + \mathbf{a}_k \alpha_j + \mathbf{b}_k \beta_i + \mathbf{b}_k \beta_j, \frac{1}{\hbar \mathcal{A}_i \mathcal{A}_j} \right. \\ \left. \left(\hbar \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_i + \hbar \mathbf{y}_k \mathcal{A}_j \eta_j + \hbar \mathbf{x}_k \mathcal{A}_i \xi_i + \mathcal{A}_i \mathcal{A}_j \eta_j \xi_i - \mathbf{B}_k \mathcal{A}_i \mathcal{A}_j \eta_j \xi_i + \hbar \mathbf{x}_k \mathcal{A}_i \mathcal{A}_j \xi_j \right), \right. \\ \left. 1 + \frac{1}{4 \hbar \mathcal{A}_i \mathcal{A}_j} \left(-4 \hbar \mathbf{y}_k \mathcal{A}_j \beta_i \eta_j - 4 \hbar \mathbf{x}_k \mathcal{A}_i \beta_j \xi_i + 4 \gamma \hbar^2 \mathbf{x}_k \mathbf{y}_k \eta_j \xi_i + \right. \right. \\ \left. \left. 4 \hbar \mathbf{a}_k \mathbf{B}_k \mathcal{A}_i \mathcal{A}_j \eta_j \xi_i + 2 \gamma \hbar \mathbf{y}_k \mathcal{A}_j \eta_j^2 \xi_i - 6 \gamma \hbar \mathbf{B}_k \mathbf{y}_k \mathcal{A}_j \eta_j^2 \xi_i + 2 \gamma \hbar \mathbf{x}_k \mathcal{A}_i \eta_j \xi_i^2 - \right. \right. \\ \left. \left. 6 \gamma \hbar \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i \eta_j \xi_i^2 + \gamma \mathcal{A}_i \mathcal{A}_j \eta_j^2 \xi_i^2 - 4 \gamma \mathbf{B}_k \mathcal{A}_i \mathcal{A}_j \eta_j^2 \xi_i^2 + 3 \gamma \mathbf{B}_k^2 \mathcal{A}_i \mathcal{A}_j \eta_j^2 \xi_i^2 \right) \in + \frac{1}{288 \hbar^2 \mathcal{A}_i^2 \mathcal{A}_j^2} \right. \\ \left(144 \hbar^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i^2 \eta_j + 144 \hbar^2 \mathbf{y}_k^2 \mathcal{A}_j^2 \beta_i^2 \eta_j^2 + 144 \hbar^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j^2 \xi_i + 144 \gamma^2 \hbar^4 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j \xi_i - \right. \\ 144 \hbar^3 \mathbf{a}_k^2 \mathbf{B}_k \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j \xi_i - 288 \gamma \hbar^3 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_i \eta_j \xi_i - 288 \gamma \hbar^3 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_j \eta_j \xi_i + \\ 288 \hbar^2 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_i \beta_j \eta_j \xi_i + 144 \gamma^2 \hbar^4 \mathbf{x}_k \mathbf{y}_k^2 \mathcal{A}_j \eta_j^2 \xi_i + 72 \gamma^2 \hbar^3 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^2 \xi_i - \\ 360 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^2 \xi_i + 432 \gamma \hbar^3 \mathbf{a}_k \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^2 \xi_i - 288 \gamma \hbar^3 \mathbf{x}_k \mathbf{y}_k^2 \mathcal{A}_j \beta_i \eta_j^2 \xi_i - \\ 144 \gamma \hbar^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i \eta_j^2 \xi_i + 432 \gamma \hbar^2 \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i \eta_j^2 \xi_i - 288 \hbar^2 \mathbf{a}_k \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i \eta_j^2 \xi_i + \\ 48 \gamma^2 \hbar^3 \mathbf{y}_k^2 \mathcal{A}_j^2 \eta_j^3 \xi_i - 336 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{y}_k^2 \mathcal{A}_j^2 \eta_j^3 \xi_i - 144 \gamma \hbar^2 \mathbf{y}_k^2 \mathcal{A}_j^2 \beta_i \eta_j^3 \xi_i + 432 \gamma \hbar^2 \mathbf{B}_k \mathbf{y}_k^2 \mathcal{A}_j^2 \beta_i \eta_j^3 \xi_i + \\ 144 \hbar^2 \mathbf{x}_k^2 \mathcal{A}_i^2 \beta_j^2 \xi_i^2 + 144 \gamma^2 \hbar^4 \mathbf{x}_k^2 \mathbf{y}_k \mathcal{A}_i \eta_j \xi_i^2 + 72 \gamma^2 \hbar^3 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j \xi_i^2 - 360 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j \xi_i^2 + \\ 432 \gamma \hbar^3 \mathbf{a}_k \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j \xi_i^2 - 288 \gamma \hbar^3 \mathbf{x}_k^2 \mathbf{y}_k \mathcal{A}_i \beta_j \eta_j \xi_i^2 - 144 \gamma \hbar^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j \eta_j \xi_i^2 + \\ 432 \gamma \hbar^2 \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j \eta_j \xi_i^2 - 288 \hbar^2 \mathbf{a}_k \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j \eta_j \xi_i^2 + 144 \gamma^2 \hbar^4 \mathbf{x}_k^2 \mathbf{y}_k^2 \eta_j^2 \xi_i^2 + \\ 360 \gamma^2 \hbar^3 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j^2 \xi_i^2 - 1512 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j^2 \xi_i^2 + 288 \gamma \hbar^3 \mathbf{a}_k \mathbf{B}_k \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j^2 \xi_i^2 + \\ 36 \gamma^2 \hbar^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^2 \xi_i^2 - 216 \gamma^2 \hbar^2 \mathbf{B}_k \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^2 \xi_i^2 + 288 \gamma \hbar^2 \mathbf{a}_k \mathbf{B}_k \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^2 \xi_i^2 + \\ 180 \gamma^2 \hbar^2 \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^2 \xi_i^2 - 432 \gamma \hbar^2 \mathbf{a}_k \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^2 \xi_i^2 + 144 \hbar^2 \mathbf{a}_k^2 \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^2 \xi_i^2 - \\ 144 \gamma \hbar^2 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_i \eta_j^2 \xi_i^2 + 432 \gamma \hbar^2 \mathbf{B}_k \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_i \eta_j^2 \xi_i^2 - 144 \gamma \hbar^2 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_j \eta_j^2 \xi_i^2 + \\ 432 \gamma \hbar^2 \mathbf{B}_k \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \beta_j \eta_j^2 \xi_i^2 + 144 \gamma^2 \hbar^3 \mathbf{x}_k \mathbf{y}_k^2 \mathcal{A}_j \eta_j^3 \xi_i^2 - 432 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{x}_k \mathbf{y}_k^2 \mathcal{A}_j \eta_j^3 \xi_i^2 + \\ 120 \gamma^2 \hbar^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^3 \xi_i^2 - 816 \gamma^2 \hbar^2 \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^3 \xi_i^2 + 144 \gamma \hbar^2 \mathbf{a}_k \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^3 \xi_i^2 + \\ 984 \gamma^2 \hbar^2 \mathbf{B}_k^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^3 \xi_i^2 - 432 \gamma \hbar^2 \mathbf{a}_k \mathbf{B}_k^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^3 \xi_i^2 - 72 \gamma \hbar \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i \eta_j^3 \xi_i^2 + \\ 288 \gamma \hbar \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i \eta_j^3 \xi_i^2 - 216 \gamma \hbar \mathbf{B}_k^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \beta_i \eta_j^3 \xi_i^2 + 36 \gamma^2 \hbar^2 \mathbf{y}_k^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^2 - \\ 216 \gamma^2 \hbar^2 \mathbf{B}_k \mathbf{y}_k^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^2 + 324 \gamma^2 \hbar^2 \mathbf{B}_k^2 \mathbf{y}_k^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^2 + 48 \gamma^2 \hbar^3 \mathbf{x}_k^2 \mathcal{A}_i \eta_j \xi_i^3 - 336 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{x}_k^2 \mathcal{A}_i \eta_j \xi_i^3 - \\ 144 \gamma \hbar^2 \mathbf{x}_k^2 \mathcal{A}_i^2 \beta_j \eta_j \xi_i^3 + 432 \gamma \hbar^2 \mathbf{B}_k \mathbf{x}_k^2 \mathcal{A}_i^2 \beta_j \eta_j \xi_i^3 + 144 \gamma^2 \hbar^3 \mathbf{x}_k^2 \mathbf{y}_k \mathcal{A}_i \eta_j^2 \xi_i^3 - \\ 432 \gamma^2 \hbar^3 \mathbf{B}_k \mathbf{x}_k^2 \mathbf{y}_k \mathcal{A}_i \eta_j^2 \xi_i^3 + 120 \gamma^2 \hbar^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^2 \xi_i^3 - 816 \gamma^2 \hbar^2 \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^2 \xi_i^3 + \\ 144 \gamma \hbar^2 \mathbf{a}_k \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^2 \xi_i^3 + 984 \gamma^2 \hbar^2 \mathbf{B}_k^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^2 \xi_i^3 - 432 \gamma \hbar^2 \mathbf{a}_k \mathbf{B}_k^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^2 \xi_i^3 - \\ 72 \gamma \hbar \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j \eta_j^2 \xi_i^3 + 288 \gamma \hbar \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j \eta_j^2 \xi_i^3 - 216 \gamma \hbar \mathbf{B}_k^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \beta_j \eta_j^2 \xi_i^3 + \\ 144 \gamma^2 \hbar^2 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j^3 \xi_i^3 - 720 \gamma^2 \hbar^2 \mathbf{B}_k \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j^3 \xi_i^3 + 864 \gamma^2 \hbar^2 \mathbf{B}_k^2 \mathbf{x}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j \eta_j^3 \xi_i^3 + \\ 40 \gamma^2 \hbar \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 - 312 \gamma^2 \hbar \mathbf{B}_k \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 + 72 \gamma \hbar \mathbf{a}_k \mathbf{B}_k \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 + 600 \gamma^2 \hbar \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 - \\ 288 \gamma \hbar \mathbf{a}_k \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 - 328 \gamma^2 \hbar \mathbf{B}_k^3 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 + 216 \gamma \hbar \mathbf{a}_k \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^3 \xi_i^3 + 36 \gamma^2 \hbar \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^4 \xi_i^3 - \\ 252 \gamma^2 \hbar \mathbf{B}_k \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^4 \xi_i^3 + 540 \gamma^2 \hbar \mathbf{B}_k^2 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^4 \xi_i^3 - 324 \gamma^2 \hbar \mathbf{B}_k^3 \mathbf{y}_k \mathcal{A}_i \mathcal{A}_j^2 \eta_j^4 \xi_i^3 + \\ 36 \gamma^2 \hbar^2 \mathbf{x}_k^2 \mathcal{A}_i^2 \eta_j^2 \xi_i^4 - 216 \gamma^2 \hbar^2 \mathbf{B}_k \mathbf{x}_k^2 \mathcal{A}_i^2 \eta_j^2 \xi_i^4 + 324 \gamma^2 \hbar^2 \mathbf{B}_k^2 \mathbf{x}_k^2 \mathcal{A}_i^2 \eta_j^2 \xi_i^4 + 36 \gamma^2 \hbar \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^3 \xi_i^4 - \\ 252 \gamma^2 \hbar \mathbf{B}_k \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^3 \xi_i^4 + 540 \gamma^2 \hbar \mathbf{B}_k^2 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^3 \xi_i^4 - 324 \gamma^2 \hbar \mathbf{B}_k^3 \mathbf{x}_k \mathcal{A}_i^2 \mathcal{A}_j \eta_j^3 \xi_i^4 + 9 \gamma^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^4 - \\ 72 \gamma^2 \mathbf{B}_k \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^4 + 198 \gamma^2 \mathbf{B}_k^2 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^4 - 216 \gamma^2 \mathbf{B}_k^3 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^4 + 81 \gamma^2 \mathbf{B}_k^4 \mathcal{A}_i^2 \mathcal{A}_j^2 \eta_j^4 \xi_i^4) \in^2 + \mathbf{O}[\epsilon]^3 \right]$$

In[*]:= \$k = 4

Out[*]:= 4

In[*]:= $\mathbf{b}\Delta_{1 \rightarrow 2,3}$

$$\begin{aligned} \text{Out[*]} = & \mathbb{E}_{\{1\} \rightarrow \{2,3\}} \left[\mathbf{b}_2 \beta_1 + \mathbf{b}_3 \beta_1, \mathbf{B}_3 y_2 \eta_1 + y_3 \eta_1, 1 + \frac{1}{2} \gamma \hbar \mathbf{B}_3 y_2 y_3 \eta_1^2 \in + \right. \\ & \frac{1}{24} \left(6 \gamma^2 \hbar^2 \mathbf{B}_3 y_2 y_3 \eta_1^2 + 4 \gamma^2 \hbar^2 \mathbf{B}_3^2 y_2^2 y_3 \eta_1^3 + 4 \gamma^2 \hbar^2 \mathbf{B}_3 y_2 y_3^2 \eta_1^3 + 3 \gamma^2 \hbar^2 \mathbf{B}_3^2 y_2^2 y_3^2 \eta_1^4 \right) \in^2 + \\ & \frac{1}{48} \left(4 \gamma^3 \hbar^3 \mathbf{B}_3 y_2 y_3 \eta_1^2 + 8 \gamma^3 \hbar^3 \mathbf{B}_3^2 y_2^2 y_3 \eta_1^3 + 8 \gamma^3 \hbar^3 \mathbf{B}_3 y_2 y_3^2 \eta_1^3 + 2 \gamma^3 \hbar^3 \mathbf{B}_3^3 y_2^3 y_3 \eta_1^4 + 16 \gamma^3 \hbar^3 \mathbf{B}_3^2 y_2^2 y_3^2 \eta_1^4 + \right. \\ & \left. 2 \gamma^3 \hbar^3 \mathbf{B}_3 y_2 y_3^3 \eta_1^4 + 4 \gamma^3 \hbar^3 \mathbf{B}_3^3 y_2^3 y_3^2 \eta_1^5 + 4 \gamma^3 \hbar^3 \mathbf{B}_3^2 y_2^2 y_3^3 \eta_1^5 + \gamma^3 \hbar^3 \mathbf{B}_3^3 y_2^3 y_3^3 \eta_1^6 \right) \in^3 + \\ & \frac{1}{5760} \left(120 \gamma^4 \hbar^4 \mathbf{B}_3 y_2 y_3 \eta_1^2 + 560 \gamma^4 \hbar^4 \mathbf{B}_3^2 y_2^2 y_3 \eta_1^3 + 560 \gamma^4 \hbar^4 \mathbf{B}_3 y_2 y_3^2 \eta_1^3 + 360 \gamma^4 \hbar^4 \mathbf{B}_3^3 y_2^3 y_3 \eta_1^4 + \right. \\ & 2460 \gamma^4 \hbar^4 \mathbf{B}_3^2 y_2^2 y_3^2 \eta_1^4 + 360 \gamma^4 \hbar^4 \mathbf{B}_3 y_2 y_3^3 \eta_1^4 + 48 \gamma^4 \hbar^4 \mathbf{B}_3^4 y_2^4 y_3 \eta_1^5 + 1536 \gamma^4 \hbar^4 \mathbf{B}_3^3 y_2^3 y_3^2 \eta_1^5 + \\ & 1536 \gamma^4 \hbar^4 \mathbf{B}_3^2 y_2^2 y_3^3 \eta_1^5 + 48 \gamma^4 \hbar^4 \mathbf{B}_3 y_2 y_3^4 \eta_1^5 + 200 \gamma^4 \hbar^4 \mathbf{B}_3^4 y_2^4 y_3^2 \eta_1^6 + 940 \gamma^4 \hbar^4 \mathbf{B}_3^3 y_2^3 y_3^3 \eta_1^6 + \\ & \left. 200 \gamma^4 \hbar^4 \mathbf{B}_3^2 y_2^2 y_3^4 \eta_1^6 + 120 \gamma^4 \hbar^4 \mathbf{B}_3^4 y_2^4 y_3^3 \eta_1^7 + 120 \gamma^4 \hbar^4 \mathbf{B}_3^3 y_2^3 y_3^4 \eta_1^7 + 15 \gamma^4 \hbar^4 \mathbf{B}_3^4 y_2^4 y_3^4 \eta_1^8 \right) \in^4 + \mathbf{O}[\in^5] \end{aligned}$$