

$$V@r_{3,-1}[i_, j_] :=$$

$$\begin{aligned} & \left(-4 T^3 p_i x_i + 4 T^3 p_j x_i - 2 T^2 (7 + 5 T) p_i p_j x_i^2 + 2 T^2 (7 + 5 T) p_j^2 x_i^2 - \right. \\ & 4 T^2 (-6 + 5 T) p_i^2 p_j x_i^3 + 4 T (-2 - 17 T + 16 T^2) p_i p_j^2 x_i^3 - \\ & 4 T (-2 - 11 T + 11 T^2) p_j^3 x_i^3 + 3 (-1 + T) T^2 p_i^3 p_j x_i^4 - 3 (-1 + T) T (3 + 4 T) p_i^2 p_j^2 x_i^4 + \\ & (-1 + T) (1 + 22 T + 13 T^2) p_i p_j^3 x_i^4 - (-1 + T) (1 + 13 T + 4 T^2) p_j^4 x_i^4 + \\ & 28 T^3 p_i p_j x_i x_j - 28 T^3 p_j^2 x_i x_j - 36 T^3 p_i^2 p_j x_i^2 x_j + 12 T^2 (2 + 9 T) p_i p_j^2 x_i^2 x_j - \\ & 24 T^2 (1 + 3 T) p_j^3 x_i^2 x_j + 4 T^3 p_i^3 p_j x_i^3 x_j - 28 T^2 p_i^2 p_j^2 x_i^3 x_j - \\ & 4 T (-1 - 17 T + 6 T^2) p_i p_j^3 x_i^3 x_j + 4 T (-1 - 10 T + 5 T^2) p_j^4 x_i^3 x_j - \\ & 24 T^3 p_i p_j^2 x_i x_j^2 + 24 T^3 p_j^3 x_i x_j^2 + 24 T^3 p_i^2 p_j^2 x_i^2 x_j^2 - 6 T^2 (1 + 10 T) p_i p_j^3 x_i^2 x_j^2 + \\ & \left. 6 T^2 (1 + 6 T) p_j^4 x_i^2 x_j^2 + 4 T^3 p_i p_j^3 x_i x_j^3 - 4 T^3 p_j^4 x_i x_j^3 \right) / (24 T^3) \end{aligned}$$