$p := p_2 \cdot x^2 + p_1 \cdot x + p_0$

$$p := p_2 x^2 + p_1 x + p_0 \tag{1}$$

$q := q_2 \cdot x^2 + q_1 \cdot x + q_0$

$$q := q_2 x^2 + q_1 x + q_0 \tag{2}$$

$r := r_2 \cdot x^2 + r_1 \cdot x + r_0$

$$r := r_2 x^2 + r_1 x + r_0 \tag{3}$$

$P := collect(q' \cdot r - q \cdot r', x)$

$$P := \left(-q_1 r_2 + q_2 r_1\right) x^2 + \left(-2 q_0 r_2 + 2 q_2 r_0\right) x - q_0 r_1 + q_1 r_0 \tag{4}$$

$Q := collect(r' \cdot p - r \cdot p', x)$

$$Q := \left(r_2 p_1 - r_1 p_2\right) x^2 + \left(2 r_2 p_0 - 2 r_0 p_2\right) x + r_1 p_0 - r_0 p_1 \tag{5}$$

$R := collect(p' \cdot q - p \cdot q', x)$

$$R := \left(-p_1 q_2 + p_2 q_1\right) x^2 + \left(-2 p_0 q_2 + 2 p_2 q_0\right) x - p_0 q_1 + p_1 q_0 \tag{6}$$

$$\mathrm{M} := \begin{bmatrix} coeff(p,x,0) & coeff(q,x,0) & coeff(r,x,0) \\ coeff(p,x,1) & coeff(q,x,1) & coeff(r,x,1) \\ coeff(p,x,2) & coeff(q,x,2) & coeff(r,x,2) \end{bmatrix}$$

$$M := \begin{bmatrix} p_0 & q_0 & r_0 \\ p_1 & q_1 & r_1 \\ p_2 & q_2 & r_2 \end{bmatrix} \tag{7}$$

$\Delta := |M|$

$$\Delta := p_0 q_1 r_2 - p_0 q_2 r_1 - p_1 q_0 r_2 + p_1 q_2 r_0 + p_2 q_0 r_1 - p_2 q_1 r_0 \tag{8}$$

$$\phi_1 := -\frac{1}{16 \cdot \Delta}\left(coeff(P,x,2)^2 \cdot coeff(Q,x,0) \cdot coeff(R,x,0) + coeff(P,x,2) \cdot coeff(P,x,0) \cdot \left(coeff(Q,x,2) \cdot coeff(R,x,0) + coeff(Q,x,1) \cdot coeff(R,x,1) + coeff(Q,x,0) \cdot coeff(R,x,2)\right) + coeff(P,x,0)^2 \cdot coeff(Q,x,2) \cdot coeff(R,x,2)\right)$$

$$\psi_1 := -\left(\left(-q_1 r_2 + q_2 r_1\right)^2 \left(r_1 p_0 - r_0 p_1\right)\left(-p_0 q_1 + p_1 q_0\right) + \left(-q_1 r_2 + q_2 r_1\right)\left(-q_0 r_1 + q_1 r_0\right)\left(\left(p_1 r_2 - p_2 r_1\right)\left(-p_0 q_1 + p_1 q_0\right) + \left(2 p_0 r_2 - 2 p_2 r_0\right)\left(-2 p_0 q_2 + 2 p_2 q_0\right) + \left(r_1 p_0 - r_0 p_1\right)\left(-p_1 q_2 + p_2 q_1\right)\right) + \left(-q_0 r_1 + q_1 r_0\right)^2 \left(p_1 r_2 - p_2 r_1\right)\left(-p_1 q_2 + p_2 q_1\right)\right) \Big/ \left(16\left(p_0 q_1 r_2 - p_0 q_2 r_1 - p_1 q_0 r_2 + p_1 q_2 r_0 + p_2 q_0 r_1 - p_2 q_1 r_0\right)\right) \tag{9}$$

$$\phi_2 := -\frac{1}{16 \cdot \Delta}\left(coeff(Q,x,2)^2 \cdot coeff(P,x,0) \cdot coeff(R,x,0) + coeff(Q,x,2) \cdot coeff(Q,x,0) \cdot \left(coeff(P,x,2) \cdot coeff(R,x,0) + coeff(P,x,1) \cdot coeff(R,x,1) + coeff(P,x,0) \cdot coeff(R,x,2)\right) + coeff(Q,x,0)^2 \cdot coeff(P,x,2) \cdot coeff(R,x,2)\right)$$

$$\psi_2 := -\left(\left(p_1 r_2 - p_2 r_1\right)^2 \left(-q_0 r_1 + q_1 r_0\right)\left(-p_0 q_1 + p_1 q_0\right) + \left(p_1 r_2 - p_2 r_1\right)\left(r_1 p_0 - r_0 p_1\right)\left(\left(-q_1 r_2 \right. \right. \right. \tag{10}$$

$$+ q_2 r_1\big)\big(-p_0 q_1 + p_1 q_0\big) + \big(-2 q_0 r_2 + 2 q_2 r_0\big)\big(-2 p_0 q_2 + 2 p_2 q_0\big) + \big(-q_0 r_1 + q_1 r_0\big)\big(-p_1 q_2 + p_2 q_1\big)\big) + \big(r_1 p_0 - r_0 p_1\big)^2 \big(-q_1 r_2 + q_2 r_1\big)\big(-p_1 q_2 + p_2 q_1\big)\big) \Big/ \big(16\big(p_0 q_1 r_2 - p_0 q_2 r_1 - p_1 q_0 r_2 + p_1 q_2 r_0 + p_2 q_0 r_1 - p_2 q_1 r_0\big)\big)$$

$$\phi_3 := -\frac{1}{16\cdot\Delta}\big(coeff(R,x,2)^2 \cdot coeff(Q,x,0)\cdot coeff(P,x,0) + coeff(R,x,2)\cdot coeff(R,x,0)\cdot\big(coeff(Q,x,2)\cdot coeff(P,x,0) + coeff(Q,x,1)\cdot coeff(P,x,1) + coeff(Q,x,0)\cdot coeff(P,x,2)\big) + coeff(R,x,0)^2 \cdot coeff(Q,x,2)\cdot coeff(P,x,2)\big)$$

$$\psi_3 := -\Big(\big(-p_1 q_2 + p_2 q_1\big)^2\big(r_1 p_0 - r_0 p_1\big)\big(-q_0 r_1 + q_1 r_0\big) + \big(-p_1 q_2 + p_2 q_1\big)\big(-p_0 q_1 + p_1 q_0\big)\big(\big(p_1 r_2 - p_2 r_1\big)\big(-q_0 r_1 + q_1 r_0\big) + \big(2 p_0 r_2 - 2 p_2 r_0\big)\big(-2 q_0 r_2 + 2 q_2 r_0\big) + \big(r_1 p_0 - r_0 p_1\big)\big(-q_1 r_2 + q_2 r_1\big)\big) + \big(-p_0 q_1 + p_1 q_0\big)^2\big(p_1 r_2 - p_2 r_1\big)\big(-q_1 r_2 + q_2 r_1\big)\Big) \Big/ \big(16\big(p_0 q_1 r_2 - p_0 q_2 r_1 - p_1 q_0 r_2 + p_1 q_2 r_0 + p_2 q_0 r_1 - p_2 q_1 r_0\big)\big) \tag{11}$$

$$C := \begin{bmatrix} \mathrm{coeff(P,x,2)} & coeff(Q,x,2) & coeff(R,x,2) & 0 \\ -coeff(P,x,1) & -coeff(Q,x,1) & -coeff(R,x,1) & 0 \\ -coeff(P,x,0) & -coeff(Q,x,0) & -coeff(R,x,0) & 0 \\ \phi_1 & \phi_2 & \phi_3 & -\frac{1}{16\cdot\Delta} \end{bmatrix}$$

$$C := \tag{12}$$

$$\begin{bmatrix} \\ \\ \\ -\frac{\big(-q_1 r_2 + q_2 r_1\big)^2\big(r_1 p_0 - r_0 p_1\big)\big(-p_0 q_1 + p_1 q_0\big) + \big(-q_1 r_2 + q_2 r_1\big)\big(-q_0 r_1 + q_1 r_0\big)\big(\big(}{} \end{bmatrix} \begin{matrix} \dots \\ \dots \\ \dots \\ \dots \end{matrix}$$

$$\mu := (j,k,l,m)\quad coeff(P,x,j)\cdot coeff(p,x,k)\cdot coeff(p,x,l)\cdot coeff(q,x,m)\cdot coeff(r,x,m) + coeff(Q,x,j)\cdot coeff(q,x,k)\cdot coeff(q,x,l)\cdot coeff(p,x,m)\cdot coeff(r,x,m) + coeff(R,x,j)\cdot coeff(r,x,k)\cdot coeff(r,x,l)\cdot coeff(p,x,m)\cdot coeff(q,x,m)$$

$$\mu := (j,k,l,m)\quad coeff(P,x,j)\cdot coeff(p,x,k)\cdot coeff(p,x,l)\cdot coeff(q,x,m)\cdot coeff(r,x,m) + coeff(Q,x,j)\cdot coeff(q,x,k)\cdot coeff(q,x,l)\cdot coeff(p,x,m)\cdot coeff(r,x,m) + coeff(R,x,j)\cdot coeff(r,x,k)\cdot coeff(r,x,l)\cdot coeff(p,x,m)\cdot coeff(q,x,m) \tag{13}$$

$$\psi_0 := 4\cdot\mu(0,0,0,2) + \mu(2,1,1,0) + \mu(2,0,0,1)$$

$$\psi_0 := 4\big(-q_0 r_1 + q_1 r_0\big)p_0^2 q_2 r_2 + 4\big(r_1 p_0 - r_0 p_1\big)q_0^2 p_2 r_2 + 4\big(-p_0 q_1 + p_1 q_0\big)r_0^2 p_2 q_2 + \big(-q_1 r_2 + q_2 r_1\big)p_1^2 q_0 r_0 + \big(p_1 r_2 - p_2 r_1\big)q_1^2 p_0 r_0 + \big(-p_1 q_2 + p_2 q_1\big)r_1^2 p_0 q_0 + \big(-q_1 r_2 + q_2 r_1\big)p_0^2 q_1 r_1 \tag{14}$$

$$+\left(p_1 r_2 - p_2 r_1\right) q_0^{\,2} p_1 r_1 + \left(-p_1 q_2 + p_2 q_1\right) r_0^{\,2} p_1 q_1$$

$$\psi_1 := -\frac{\Delta}{2}\cdot p_1 \cdot q_1 \cdot r_1 - \mu(1,0,2,1)$$

$$\psi_1 := -\frac{\left(p_0 q_1 r_2 - p_0 q_2 r_1 - p_1 q_0 r_2 + p_1 q_2 r_0 + p_2 q_0 r_1 - p_2 q_1 r_0\right) p_1 q_1 r_1}{2} - \left(-2 q_0 r_2 \right. \tag{15}$$

$$\left. + 2 q_2 r_0\right) p_0 p_2 q_1 r_1 - \left(2 p_0 r_2 - 2 p_2 r_0\right) q_0 q_2 p_1 r_1 - \left(-2 p_0 q_2 + 2 p_2 q_0\right) r_0 r_2 p_1 q_1$$

$$\psi_2 := -4\cdot\mu(2,2,2,0) - \mu(0,1,1,2) - \mu(0,2,2,1)$$

$$\psi_2 := -4\left(-q_1 r_2 + q_2 r_1\right) p_2^{\,2} q_0 r_0 - 4\left(p_1 r_2 - p_2 r_1\right) q_2^{\,2} p_0 r_0 - 4\left(-p_1 q_2 + p_2 q_1\right) r_2^{\,2} p_0 q_0 - \left(-q_0 r_1 \right. \tag{16}$$

$$\left. + q_1 r_0\right) p_1^{\,2} q_2 r_2 - \left(r_1 p_0 - r_0 p_1\right) q_1^{\,2} p_2 r_2 - \left(-p_0 q_1 + p_1 q_0\right) r_1^{\,2} p_2 q_2 - \left(-q_0 r_1 + q_1 r_0\right) p_2^{\,2} q_1 r_1$$

$$- \left(r_1 p_0 - r_0 p_1\right) q_2^{\,2} p_1 r_1 - \left(-p_0 q_1 + p_1 q_0\right) r_2^{\,2} p_1 q_1$$

$$Cinv := \begin{bmatrix} -\frac{p_0}{\Delta} & -\frac{p_1}{2\cdot\Delta} & \frac{p_2}{\Delta} & 0 \\ -\frac{q_0}{\Delta} & -\frac{q_1}{2\cdot\Delta} & \frac{q_2}{\Delta} & 0 \\ -\frac{r_0}{\Delta} & -\frac{r_1}{2\cdot\Delta} & \frac{r_2}{\Delta} & 0 \\ \psi_0 & \psi_1 & \psi_2 & -16\cdot\Delta \end{bmatrix}$$

$$Cinv := \tag{17}$$

$$\begin{bmatrix} \cdots \\ \cdots \\ \cdots \\ 4\left(-q_0 r_1 + q_1 r_0\right) p_0^{\,2} q_2 r_2 + 4\left(r_1 p_0 - r_0 p_1\right) q_0^{\,2} p_2 r_2 + 4\left(-p_0 q_1 + p_1 q_0\right) r_0^{\,2} p_2 q_2 + \left(-q_1 r \cdots \right. \end{bmatrix}$$

$$simplify(Cinv \cdot C)$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \vdots & \vdots & \vdots & \vdots \end{bmatrix} \tag{18}$$