

Constant of prop, good up to 5th order:

$$\begin{aligned}
& 1 + \frac{V^2}{J^2} + \frac{f^2}{J^2} + \frac{V^4}{J^4} + \frac{4V^2}{J^4}f^2 + \frac{f^4}{J^4} + \frac{V^6}{J^6} + \frac{140V^4f^2}{9J^6} + \frac{55V^2f^4}{9J^6} + \frac{f^6}{J^6} + \frac{V^8}{J^8} + \frac{1352V^6f^2}{27J^8} + \frac{2141V^4f^4}{27J^8} \\
& + \frac{503V^2f^6}{27J^8} + \frac{f^8}{J^8} + \frac{V^{10}}{J^{10}} + \frac{1249879V^8f^2}{18225J^{10}} + \frac{3827636V^6f^4}{18225J^{10}} + \frac{957412V^4f^6}{6075J^{10}} + \frac{6017V^2f^8}{243J^{10}} + \frac{f^{10}}{J^{10}}
\end{aligned} \tag{1}$$

Fourth order full, normalised:

$$\begin{aligned}
& 1a_1 + \frac{f}{J}a_2 - \frac{iV}{J}b_1a_2a_3 - \frac{iV}{J^2}fa_1b_1a_3 + \frac{iVf}{3J^4}(-3J^2 - 2V^2 + 2f^2)a_2b_2a_3 \\
& - \frac{iVf}{3J^4}(3J^2 + 2V^2 + f^2)b_1a_2a_4 + \frac{f^2}{J^4}\left(J^2 - \frac{2V^2}{3}\right)a_3 - \frac{iVf}{3J^4}(3J^2 + f^2)b_2a_3a_4 \\
& - \frac{V^2}{J^4}\left(J^2 + \frac{4f^2}{3}\right)b_1a_2b_3a_4a_5 + \frac{iV}{J^3}f^2a_1b_2a_3 + \frac{V^2f}{3J^3}a_2a_3b_3a_4b_4 + \frac{f}{J^3}(V^2 + f^2)a_4 \\
& - \frac{V^2f}{J^3}b_1a_2b_3a_4a_6 + \frac{V^2f}{3J^3}b_1a_3b_3a_4a_5 + \frac{iV}{J^3}f^2a_1b_1a_2 + \frac{2V^2f}{3J^3}b_1b_2b_3a_4b_4 \\
& - \frac{V^2f}{J^3}b_1a_2b_4a_5a_6 + \frac{2iVf^2}{3J^3}b_1a_3a_4 - \frac{iV}{J^3}f^2b_1a_2a_5 - \frac{V^2f}{J^3}a_1b_1b_3a_4a_5 - \frac{iV}{J^3}f^2a_1b_1a_4 \\
& + \frac{iV^3}{J^3}b_1a_2b_3a_4b_5a_6a_7 - \frac{V^2f}{J^3}b_1a_2a_4b_4a_5 - \frac{4iVf^2}{3J^3}a_2b_2a_4 - \frac{V^2f}{J^3}a_2b_2a_3b_3a_4 \\
& - \frac{iV}{J^3}f^2a_3b_3a_4 - \frac{2V^2f}{3J^3}a_2b_2b_3a_4a_5 + \frac{V^2f}{3J^3}b_1a_2b_2a_4a_5 + \frac{iVf^2}{3J^3}b_1b_2b_3 \\
& - \frac{V^2f}{J^3}b_2a_3b_4a_5a_6 - \frac{iV}{J^3}f^2b_3a_4a_5 - \frac{V^2f}{3J^3}b_1a_2b_2b_3b_4 - \frac{iV}{J^3}f^2b_2a_3a_5 - \frac{iVf^2}{3J^3}a_2a_3b_3 \\
& - \frac{2V^2f}{3J^3}b_1a_2a_3b_3a_5 - \frac{V^2f}{J^3}a_1b_1a_2b_2a_4 - \frac{2V^2f}{3J^3}b_1a_2a_3a_4b_4 + \frac{2iV^3f}{3J^4}b_1a_2b_3a_4a_5b_5a_7 \\
& + \frac{iVf^3}{3J^4}a_1b_2a_4 - \frac{2V^2f^2}{3J^4}a_1b_1a_3b_3a_5 + \frac{2V^2f^2}{9J^4}b_1a_3a_4b_4a_5 + \frac{if}{J^4}V^3b_1a_2b_4a_5b_6a_7a_8 \\
& - \frac{2iV^3f}{3J^4}b_1b_2a_3b_3b_4a_5b_5 + \frac{2iV^3f}{3J^4}b_1a_2a_4b_4b_5a_6a_7 + \frac{V^2f^2}{3J^4}a_1b_1b_2a_4a_5 \\
& - \frac{V^2f^2}{9J^4}b_1b_2a_3a_4a_5 + \frac{4iV^3f}{9J^4}b_1a_2a_3a_4b_5a_6b_6 - \frac{2V^2f^2}{3J^4}a_3b_3b_4a_5a_6 \\
& + \frac{2iV^3f}{3J^4}a_2b_2a_3b_3b_4a_5a_6 + \frac{V^2f^2}{3J^4}b_1a_2b_3b_4b_5 + \frac{7iV^3f}{9J^4}a_2b_2b_3a_4b_5a_6a_7 \\
& - \frac{V^2f^2}{J^4}a_1b_1a_2b_2a_5 - \frac{V^2f^2}{J^4}b_2a_3b_4a_5a_7 - \frac{2iV^3f}{3J^4}a_1a_2b_2a_3b_3a_4b_4 \\
& + \frac{V^2f^2}{3J^4}a_1b_1b_2a_3a_4 - \frac{iV^3f}{3J^4}b_1a_2a_4a_5b_5a_6b_6 - \frac{V^2f^2}{J^4}a_1b_1b_3a_4a_6 - \frac{V^2f^2}{J^4}a_1b_1a_4b_4a_5 \\
& + \frac{V^2f^2}{3J^4}b_1a_2b_2a_3a_5 - \frac{iV^3f}{3J^4}b_1a_2b_3a_5b_5a_6a_7 - \frac{5V^2f^2}{9J^4}b_1a_2b_2b_3b_5 \\
& + \frac{if}{J^4}V^3b_2a_3b_4a_5b_6a_7a_8 + \frac{iV^3f}{3J^4}a_1b_1b_2a_3b_3a_4a_5 - \frac{iV^3f}{3J^4}b_1a_2b_3a_4b_4a_6a_7 \\
& + \frac{V^2f^2}{3J^4}a_1a_2b_2a_3b_3 + \frac{2iV^3f}{3J^4}b_1a_2b_3a_4a_5a_6b_6 - \frac{2V^2f^2}{3J^4}a_1b_1a_3a_4b_4 - \frac{iV}{J^4}f^3a_1b_1a_5 \\
& - \frac{iV^3f}{3J^4}a_2b_2a_3a_4b_4a_5b_5 + \frac{iVf}{9J^4}(5V^2 + 6f^2)b_2a_4a_5 - \frac{V^2f^2}{3J^4}b_2a_3b_3b_4b_5 \\
& + \frac{2V^2f^2}{3J^4}b_1a_2b_3a_5a_6 + \frac{V^2f^2}{J^4}a_1b_2a_3b_3a_4 + \frac{2V^2f^2}{9J^4}b_1a_2b_2a_4a_6 - \frac{V^2f^2}{3J^4}a_1b_1b_2b_3b_4 \\
& - \frac{14V^2f^2}{9J^4}a_2b_2b_4a_5a_6 + \frac{2iV^3f}{3J^4}a_1a_4b_4 - \frac{V^2f^2}{J^4}a_1b_1b_4a_5a_6 - \frac{V^2f^2}{J^4}b_1a_2b_4a_5a_7 \\
& - \frac{2iV^3f}{3J^4}b_1a_2b_3b_4b_5a_6b_6 - \frac{V^2f^2}{J^4}a_3b_3a_4b_4a_5 + \frac{V^2f^2}{3J^4}b_2a_4b_4a_5a_6 + \frac{V^2f^2}{J^4}a_1b_1a_2b_3a_4 \\
& - \frac{iV}{J^4}f^3b_3a_4a_6 + \frac{2iVf^3}{3J^4}a_2b_3a_4 - \frac{V^2f^2}{J^4}b_1a_2a_5b_5a_6 + \frac{V^4}{J^4}b_1a_2b_3a_4b_5a_6b_7a_8a_9 \\
& + \frac{5iV^3f}{9J^4}b_1a_2b_2b_3a_4b_4b_5 - \frac{7V^2f^2}{9J^4}a_2b_2a_3b_3a_5 + \frac{2V^2f^2}{3J^4}b_2b_3b_4a_5b_5 \\
& + \frac{if}{J^4}V^3a_1b_1a_2b_2b_4a_5a_6 - \frac{7V^2f^2}{9J^4}b_1a_2a_3b_3a_6 + \frac{if}{J^4}V^3b_1a_2b_3a_4b_6a_7a_8 \\
& + \frac{iVf}{9J^4}(4V^2 - f^2)b_1b_2b_4 + \frac{iV}{J^4}f^3a_1a_2b_2 - \frac{7V^2f^2}{9J^4}a_2b_2a_3a_4b_4 - \frac{iV^3f}{3J^4}b_1a_2b_2a_3a_4b_4a_5 \\
& + \frac{V^2f^2}{3J^4}b_2a_3b_3a_4a_5 - \frac{iV}{J^4}f(V^2 + f^2)b_1a_2a_6 + \frac{4V^2f^2}{9J^4}b_1a_3b_4a_5a_6 \\
& + \frac{if}{J^4}V^3b_1a_2b_3a_4b_5a_6a_8 + \frac{5iV^3f}{9J^4}b_1a_2b_2b_3b_5a_6b_6 - \frac{2V^2f^2}{3J^4}b_2a_3a_4b_4a_6
\end{aligned} \tag{2}$$

$$\begin{aligned}
& -\frac{5iV^3f}{9J^4}a_2a_3b_3a_4b_5a_6b_6 + \frac{if}{J^4}V^3b_1a_2a_4b_4a_5b_5a_6 - \frac{V^2f^2}{J^4}b_2a_3a_5b_5a_6 \\
& - \frac{V^2f^2}{3J^4}b_1a_2a_4a_5b_5 + \frac{V^2f^2}{3J^4}b_2a_3b_3a_5a_6 + \frac{iVf}{9J^4}(5V^2+4f^2)b_1a_3a_5 + \frac{f^2}{J^4}(2V^2+f^2)a_5 \\
& + \frac{iVf}{9J^4}(-2V^2+3f^2)b_2b_3b_4 + \frac{iV^3f}{3J^4}b_1a_2b_3a_4b_4b_5b_6 - \frac{iV^3f}{3J^4}b_1b_2a_3a_4b_4a_5a_6 \\
& + \frac{V^2f^2}{3J^4}b_1a_2a_3b_4a_5 + \frac{iVf^3}{3J^4}a_1a_3b_3 - \frac{iVf}{9J^4}(4V^2+3f^2)a_3a_4b_4 - \frac{4V^2f^2}{9J^4}b_1a_2a_3a_4b_5 \\
& + \frac{5V^2f^2}{9J^4}a_2a_3b_3b_4a_5 - \frac{7V^2f^2}{9J^4}a_2b_2b_3a_4a_6 - \frac{V^2f^2}{J^4}b_2a_3b_5a_6a_7 + \frac{if}{J^4}V^3b_1a_2b_3a_4a_6b_6a_7 \\
& - \frac{V^2f^2}{J^4}b_3a_4b_5a_6a_7 - \frac{iVf}{9J^4}(7V^2+12f^2)a_3b_3a_5 + \frac{if}{J^4}V^3a_2b_2a_3b_3a_4b_4a_5 + \frac{2V^2f^2}{9J^4}b_1a_3b_3a_4a_6 \\
& - \frac{2iV^3f}{9J^4}b_1a_3b_3a_4b_5a_6a_7 + \frac{4V^2f^2}{9J^4}b_1b_2b_3b_4a_5 + \frac{iVf}{9J^4}(2V^2+f^2)a_2a_3b_4 + \frac{4V^2f^2}{9J^4}b_1b_2b_3a_4b_5 \\
& - \frac{2V^2f^2}{3J^4}b_2a_3a_4a_5b_5 - \frac{V^2f^2}{J^4}b_1a_2b_5a_6a_7 + \frac{5V^2f^2}{9J^4}a_2a_3b_3a_4b_5 + \frac{if}{J^4}V^3a_1b_1b_3a_4b_5a_6a_7 \\
& + \frac{V^2f^2}{J^4}a_1b_1a_2b_2a_3 - \frac{V^2f^2}{3J^4}a_1a_3b_3a_4b_4 - \frac{7iVf}{9J^4}(V^2+2f^2)a_2b_2a_5 - \frac{V^2f^2}{J^4}b_1a_2b_3a_4a_7 \\
& - \frac{iV}{J^4}f^3a_4b_4a_5 + \frac{V^2f^2}{J^4}b_1a_2a_3b_3a_4 + \frac{if}{J^4}V^3a_1b_1a_2b_2a_3b_3a_5 + \frac{7iV^3f}{9J^4}b_1a_2a_3b_3a_4b_4a_6 \\
& - \frac{iV}{J^4}f(V^2+f^2)b_4a_5a_6 - \frac{V^2f^2}{9J^4}b_1b_2b_4a_5b_5 - \frac{4iV^3f}{9J^4}b_1b_2b_3a_4b_5a_6b_6 + \frac{V^2f^2}{3J^4}a_3a_4b_4a_5b_5 \\
& - \frac{2iV^3f}{9J^4}b_1a_2b_2a_4b_5a_6a_7 + \frac{2V^2f^2}{3J^4}a_1b_2b_3a_4a_5 - \frac{iV^3f}{3J^4}a_1b_3a_5 - \frac{4V^2f^2}{3J^4}b_1a_2a_4b_4a_6 \\
& + \frac{V^2f^2}{9J^4}a_2a_3b_4a_5b_5 + \frac{7V^2f^2}{9J^4}b_1b_2a_3b_3b_4 + \frac{7iV^3f}{9J^4}b_1a_2a_3b_3b_5a_6a_7 - \frac{2iV^3f}{9J^4}b_1a_2b_2b_3a_4a_5a_6 \\
& + \frac{iV^3f}{3J^4}a_2b_4a_5 - \frac{7V^2f^2}{9J^4}a_2b_2a_4b_4a_5 - \frac{iV}{J^4}f^3b_2a_3a_6 + \frac{4iV^3f}{9J^4}b_1a_2a_3b_3a_4a_5b_5
\end{aligned} \tag{3}$$