

M = 3, n = 1:

Original equation:

$$\begin{aligned} &+3f_{-1}f_0^2 + 3f_{-1}^2f_1 + 6f_{-2}f_0f_1 + 6f_{-2}f_{-1}f_2 \\ &+ 3f_{-2}^2f_3 + 3f_{-3}f_1^2 + 6f_{-3}f_0f_2 + 6f_{-3}f_{-1}f_3 = 0 \end{aligned} \quad (1)$$

Simplified equation, where $f_{-j} = \overline{f_j}$:

$$3f_0^2\overline{f_1} + 6f_0f_1\overline{f_2} + 6f_0f_2\overline{f_3} + 3f_1^2\overline{f_3} + 3f_1\overline{f_1}^2 + 6f_2\overline{f_1f_2} + 6f_3\overline{f_1f_3} + 3f_3\overline{f_2}^2 = 0 \quad (2)$$

All possible solutions:

$$\{f_1 : 0, \quad f_2 : 0\} \quad (3)$$

$$\{f_1 : 0, \quad f_3 : 0\} \quad (4)$$