

Target equation:

$$-ia_1u^{(1,0)}(x,t)+a_{10}u^{(10,0)}(x,t)-ia_{11}u^{(11,0)}(x,t)+a_{12}u^{(12,0)}(x,t)+a_2u^{(2,0)}(x,t)-ia_3u^{(3,0)}(x,t)+a_4u^{(4,0)}(x,t)-ia_5u^{(5,0)}(x,t)+a_6u^{(6,0)}(x,t)-ia_7u^{(7,0)}(x,t)+a_8u^{(8,0)}(x,t)-ia_9u^{(9,0)}(x,t)-bu(x,t)|u(x,t)|^2+iu^{(0,1)}(x,t)=0$$

Substitutions:

$$N = 6$$

$$u(x,t) \rightarrow y(z)e^{i(kx-\omega t)}$$

$$z \rightarrow x - C0t$$

$$y(z) \rightarrow AR(z)^6$$

$$R'(z)^2 = R(z)^2 (1 - \chi R(z)^2)$$

Imaginary part of equation after substitutions:

$$y'(z)(a_1 + k(k(-10a_{10}k^7 - 11a_{11}k^8 + 12a_{12}k^9 - 3a_3 + 4a_4k + 5a_5k^2 - 6a_6k^3 - 7a_7k^4 + 8a_8k^5 + 9a_9k^6) - 2a_2k^2 - a_3k^3 + a_4k^4 + a_5k^5 - a_6k^6 - a_7k^7 + a_8k^8 + a_9k^9 + \omega) + y^{(3)}(z)(k(k(120a_{10}k^5 + 165a_{11}k^6 - 220a_{12}k^7 - 10a_5 + 20a_6k + 35a_7k^2 - 56a_8k^3 - 84a_9k^4) - 4a_4) + a_3) - 252a_{10}k^5y^{(5)}(z) + 120a_{10}k^3y^{(7)}(z) - 10a_{10}ky^{(9)}(z) - 462a_{11}k^6y^{(5)}(z) + 330a_{11}k^4y^{(7)}(z) - 55a_{11}k^2y^{(9)}(z) + a_{11}y^{(11)}(z) + 792a_{12}k^7y^{(5)}(z) - 792a_{12}k^5y^{(7)}(z) + 220a_{12}k^3y^{(9)}(z) - 12a_{12}ky^{(11)}(z) + a_5y^{(5)}(z) - 6a_6ky^{(5)}(z) - 21a_7k^2y^{(5)}(z) + a_7y^{(7)}(z) + 56a_8k^3y^{(5)}(z) - 8a_8ky^{(7)}(z) + 126a_9k^4y^{(5)}(z) - 36a_9k^2y^{(7)}(z) + a_9y^{(9)}(z) = 0$$

Real part of equation after substitutions:

$$y(z)(a_1k - a_{10}k^{10} - a_{11}k^{11} + a_{12}k^{12} - a_2k^2 - a_3k^3 + a_4k^4 + a_5k^5 - a_6k^6 - a_7k^7 + a_8k^8 + a_9k^9 + \omega) + y''(z)(k(45a_{10}k^7 + 55a_{11}k^8 - 66a_{12}k^9 + 3a_3 - 6a_4k - 10a_5k^2 + 15a_6k^3 + 21a_7k^4 - 28a_8k^5 - 36a_9k^6) + a_2) - 210a_{10}k^6y^{(4)}(z) + 210a_{10}k^4y^{(6)}(z) - 45a_{10}k^2y^{(8)}(z) + a_{10}y^{(10)}(z) - 330a_{11}k^7y^{(4)}(z) + 462a_{11}k^5y^{(6)}(z) - 165a_{11}k^3y^{(8)}(z) + 11a_{11}ky^{(10)}(z) + 495a_{12}k^8y^{(4)}(z) - 924a_{12}k^6y^{(6)}(z) + 495a_{12}k^4y^{(8)}(z) - 66a_{12}k^2y^{(10)}(z) + a_{12}y^{(12)}(z) + a_4y^{(4)}(z) + 5a_5ky^{(4)}(z) - 15a_6k^2y^{(4)}(z) + a_6y^{(6)}(z) - 35a_7k^3y^{(4)}(z) + 7a_7ky^{(6)}(z) + 70a_8k^4y^{(4)}(z) - 28a_8k^2y^{(6)}(z) + a_8y^{(8)}(z) + 126a_9k^5y^{(4)}(z) - 84a_9k^3y^{(6)}(z) + 9a_9ky^{(8)}(z) - by(z)^3 = 0$$

Constraints on coefficients from imaginary part of equation:

$$a_{11} \rightarrow 12a_{12}k$$

$$a_9 \rightarrow 10(a_{10}k + 44a_{12}k^3)$$

$$a_7 \rightarrow 8(30a_{10}k^3 + 1584a_{12}k^5 + a_8k)$$

$$a_5 \rightarrow 2(2016a_{10}k^5 + 107712a_{12}k^7 + 3a_6k + 56a_8k^3)$$

$$a_3 \rightarrow 4k(8160a_{10}k^6 + 436480a_{12}k^8 + a_4 + 10a_6k^2 + 224a_8k^4)$$

$$C0 \rightarrow a_1 - 79360a_{10}k^9 - 4245504a_{12}k^{11} - 2a_2k - 8a_4k^3 - 96a_6k^5 - 2176a_8k^7$$

Constraints on coefficients from real part of equation:

$$b \rightarrow \frac{2964061900800a_{12}\chi^6}{A^2}$$

$$a_{10} \rightarrow -2(33a_{12}k^2 + 398a_{12})$$

$$a_8 \rightarrow 3(165a_{12}k^4 + 11940a_{12}k^2 + 82256a_{12})$$

$$a_6 \rightarrow -4(231a_{12}k^6 + 41790a_{12}k^4 + 1727376a_{12}k^2 + 9460432a_{12})$$

$$a_4 \rightarrow 495a_{12}k^8 + 167160a_{12}k^6 + 17273760a_{12}k^4 + 567625920a_{12}k^2 + 3000595456a_{12}$$

$$a_2 \rightarrow -6(11a_{12}k^{10} + 5970a_{12}k^8 + 1151584a_{12}k^6 + 94604320a_{12}k^4 + 3000595456a_{12}k^2 + 19242909696a_{12})$$

$$\omega \rightarrow -a_1k - 11a_{12}k^{12} - 7164a_{12}k^{10} - 1727376a_{12}k^8 - 189208640a_{12}k^6 - 9001786368a_{12}k^4 - 115457458176a_{12}k^2 + 1664719257600a_{12}$$

y(z) - function:

$$\frac{4096a^6A}{(4a^2e^z + \chi e^{-z})^6}$$

u(x, t) - function:

$$\frac{4096a^6Ae^{i(kx-\omega t)}}{(4a^2e^{C_0t+x} + \chi e^{-C_0t-x})^6}$$