Target equation:

$$-ia_1u^{(1,0)}(x,t)+a_{10}u^{(10,0)}(x,t)-ia_{11}u^{(11,0)}(x,t)+a_{12}u^{(12,0)}(x,t)-ia_{13}u^{(13,0)}(x,t)+a_{14}u^{(14,0)}(x,t)+$$
$$a_2u^{(2,0)}(x,t)-ia_3u^{(3,0)}(x,t)+a_4u^{(4,0)}(x,t)-ia_5u^{(5,0)}(x,t)+a_6u^{(6,0)}(x,t)-ia_7u^{(7,0)}(x,t)+a_8u^{(8,0)}(x,t)-$$
$$ia_9u^{(9,0)}(x,t) - bu(x,t)\left|u(x,t)\right|^2 + iu^{(0,1)}(x,t) = 0$$

Substitutions:

$$\mathrm{N} = 7$$
$$u(x,t) \to y(z)e^{i(kx-\omega t)}$$
$$z \to x - \mathrm{C0}t$$
$$y(z) \to AR(z)^7$$
$$R'(z)^2 = R(z)^2\left(1-\chi R(z)^2\right)$$

Imaginary part of equation after substitutions:

$$y'(z)\left(a_1+k\left(k\left(k\left(k\left(-10a_{10}k^5-11a_{11}k^6+12a_{12}k^7+13a_{13}k^8-14a_{14}k^9+5a_5-6a_6k-7a_7k^2+8a_8k^3+9\right.\right.\right.\right.$$
$$y^{(3)}(z)\left(k\left(k\left(120a_{10}k^5+165a_{11}k^6-220a_{12}k^7-286a_{13}k^8+364a_{14}k^9-10a_5+20a_6k+35a_7k^2-56a_8k^3-8\right.\right.\right.$$
$$252a_{10}k^5y^{(5)}(z)+120a_{10}k^3y^{(7)}(z)-10a_{10}ky^{(9)}(z)-462a_{11}k^6y^{(5)}(z)+330a_{11}k^4y^{(7)}(z)-55a_{11}k^2y^{(9)}(z)+$$
$$a_{11}y^{(11)}(z)+792a_{12}k^7y^{(5)}(z)-792a_{12}k^5y^{(7)}(z)+220a_{12}k^3y^{(9)}(z)-12a_{12}ky^{(11)}(z)+1287a_{13}k^8y^{(5)}(z)-$$
$$1716a_{13}k^6y^{(7)}(z)+715a_{13}k^4y^{(9)}(z)-78a_{13}k^2y^{(11)}(z)+a_{13}y^{(13)}(z)-2002a_{14}k^9y^{(5)}(z)+3432a_{14}k^7y^{(7)}(z)-$$
$$2002a_{14}k^5y^{(9)}(z) + 364a_{14}k^3y^{(11)}(z) - 14a_{14}ky^{(13)}(z) + a_5y^{(5)}(z) - 6a_6ky^{(5)}(z) - 21a_7k^2y^{(5)}(z) +$$
$$a_7y^{(7)}(z) + 56a_8k^3y^{(5)}(z) - 8a_8ky^{(7)}(z) + 126a_9k^4y^{(5)}(z) - 36a_9k^2y^{(7)}(z) + a_9y^{(9)}(z) = 0$$

Real part of equation after substitutions:

$$y(z)\left(a_1k - a_{10}k^{10} - a_{11}k^{11} + a_{12}k^{12} + a_{13}k^{13} - a_{14}k^{14} - a_2k^2 - a_3k^3 + a_4k^4 + a_5k^5 - a_6k^6 - a_7k^7 + a_8k^8 +\right.$$
$$y''(z)\left(k\left(k\left(k\left(45a_{10}k^5+55a_{11}k^6-66a_{12}k^7-78a_{13}k^8+91a_{14}k^9-10a_5+15a_6k+21a_7k^2-28a_8k^3-36a_9k\right.\right.\right.\right.$$
$$210a_{10}k^6y^{(4)}(z)+210a_{10}k^4y^{(6)}(z)-45a_{10}k^2y^{(8)}(z)+a_{10}y^{(10)}(z)-330a_{11}k^7y^{(4)}(z)+462a_{11}k^5y^{(6)}(z)-$$
$$165a_{11}k^3y^{(8)}(z)+11a_{11}ky^{(10)}(z)+495a_{12}k^8y^{(4)}(z)-924a_{12}k^6y^{(6)}(z)+495a_{12}k^4y^{(8)}(z)-66a_{12}k^2y^{(10)}(z)+$$
$$a_{12}y^{(12)}(z)+715a_{13}k^9y^{(4)}(z)-1716a_{13}k^7y^{(6)}(z)+1287a_{13}k^5y^{(8)}(z)-286a_{13}k^3y^{(10)}(z)+13a_{13}ky^{(12)}(z)-$$
$$1001a_{14}k^{10}y^{(4)}(z) + 3003a_{14}k^8y^{(6)}(z) - 3003a_{14}k^6y^{(8)}(z) + 1001a_{14}k^4y^{(10)}(z) - 91a_{14}k^2y^{(12)}(z) +$$
$$a_{14}y^{(14)}(z) + a_4y^{(4)}(z) + 5a_5ky^{(4)}(z) - 15a_6k^2y^{(4)}(z) + a_6y^{(6)}(z) - 35a_7k^3y^{(4)}(z) + 7a_7ky^{(6)}(z) +$$
$$70a_8k^4y^{(4)}(z)-28a_8k^2y^{(6)}(z)+a_8y^{(8)}(z)+126a_9k^5y^{(4)}(z)-84a_9k^3y^{(6)}(z)+9a_9ky^{(8)}(z)-by(z)^3 = 0$$

Constraints on coefficients from imaginary part of equation:

$$a_{13} \to 14a_{14}k$$
$$a_{11} \to 4\left(3a_{12}k + 182a_{14}k^3\right)$$
$$a_9 \to 2\left(5a_{10}k + 220a_{12}k^3 + 16016a_{14}k^5\right)$$
$$a_7 \to 8\left(30a_{10}k^3 + 1584a_{12}k^5 + 116688a_{14}k^7 + a_8k\right)$$
$$a_5 \to 2\left(2016a_{10}k^5 + 107712a_{12}k^7 + 7943936a_{14}k^9 + 3a_6k + 56a_8k^3\right)$$
$$a_3 \to 4k\left(8160a_{10}k^6 + 436480a_{12}k^8 + 32195072a_{14}k^{10} + a_4 + 10a_6k^2 + 224a_8k^4\right)$$

$\mathrm{C0} \to a_1 - 79360a_{10}k^9 - 4245504a_{12}k^{11} - 313155584a_{14}k^{13} - 2a_2k - 8a_4k^3 - 96a_6k^5 - 2176a_8k^7$

Constraints on coefficients from real part of equation:

$b \to -\frac{3379030566912000a_{14}\chi^7}{A^2}$

$a_{12} \to -7a_{14}\left(13k^2 + 185\right)$

$a_{10} \to 7\left(143a_{14}k^4 + 12210a_{14}k^2 + 97171a_{14}\right)$

$a_8 \to -3003a_{14}k^6 - 641025a_{14}k^4 - 30608865a_{14}k^2 - 186879835a_{14}$

$a_6 \to 7\left(429a_{14}k^8 + 170940a_{14}k^6 + 20405910a_{14}k^4 + 747519340a_{14}k^2 + 4119846629a_{14}\right)$

$a_4 \to -7\left(143a_{14}k^{10} + 91575a_{14}k^8 + 20405910a_{14}k^6 + 1868798350a_{14}k^4 + 61797699435a_{14}k^2 + 35481813383\right.$

$a_2 \to 91a_{14}k^{12} + 85470a_{14}k^{10} + 30608865a_{14}k^8 + 5232635380a_{14}k^6 + 432583896045a_{14}k^4 + 14902361621070a_{14}k^2$

$109758994449399a_{14}$

$\omega \to -a_1k + 13a_{14}k^{14} + 14245a_{14}k^{12} + 6121773a_{14}k^{10} + 1308158845a_{14}k^8 + 144194632015a_{14}k^6 +$

$7451180810535a_{14}k^4 + 109758994449399a_{14}k^2 - 1905200718446025a_{14}$

y(z) - function:

$$\frac{16384a^7A}{\left(4a^2e^z + \chi e^{-z}\right)^7}$$

u(x, t) - function:

$$\frac{16384a^7Ae^{i(kx-\omega t)}}{\left(4a^2e^{\mathrm{C0}t+x} + \chi e^{-\mathrm{C0}t-x}\right)^7}$$