Target equation:

$$-i\mathrm{a1}u^{(1,0)}(x,t)+\mathrm{a2}u^{(2,0)}(x,t)-i\mathrm{a3}u^{(3,0)}(x,t)+\mathrm{a4}u^{(4,0)}(x,t)-bu(x,t)\left|u(x,t)\right|^2+iu^{(0,1)}(x,t)=0$$

Substitutions:

$$\mathrm{N}=2$$

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

$$z\to x-\mathrm{C0}t$$

$$y(z)\to AR(z)^2$$

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

Imaginary part of equation after substitutions:

$$y'(z)\left(\mathrm{a1}-2\mathrm{a2}k-3\mathrm{a3}k^2+4\mathrm{a4}k^3-\mathrm{C0}\right)+y^{(3)}(z)(\mathrm{a3}-4\mathrm{a4}k)=0$$

Real part of equation after substitutions:

$$y(z)\left(\mathrm{a1}k-\mathrm{a2}k^2-\mathrm{a3}k^3+\mathrm{a4}k^4+\omega\right)+y''(z)(\mathrm{a2}+3k(\mathrm{a3}-2\mathrm{a4}k))+\mathrm{a4}y^{(4)}(z)-by(z)^3=0$$

Constraints on coefficients from imaginary part of equation:

$\mathrm{a3}\to 4\mathrm{a4}k$

$\mathrm{C0}\to \mathrm{a1}-2\mathrm{a2}k-8\mathrm{a4}k^3$

Constraints on coefficients from real part of equation:

$b\to \frac{120\mathrm{a4}\chi^2}{A^2}$

$\mathrm{a2}\to -2\left(3\mathrm{a4}k^2+10\mathrm{a4}\right)$

$\omega\to -\mathrm{a1}k-3\mathrm{a4}k^4-20\mathrm{a4}k^2+64\mathrm{a4}$

y(z) - function:

$$\frac{16a^2A}{\left(4a^2e^z+\chi e^{-z}\right)^2}$$

u(x, t) - function:

$$\frac{16a^2Ae^{i(kx-\omega t)}}{\left(4a^2e^{\mathrm{C0}t+x}+\chi e^{-\mathrm{C0}t-x}\right)^2}$$