Target equation:

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

Substitutions:

$$\mathrm{N} = 1$$

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

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

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

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

Imaginary part of equation after substitutions:

$y'(z)(\mathrm{a1} - 2\mathrm{a2}k - \mathrm{C0}) = 0$

Real part of equation after substitutions:

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

Constraints on coefficients from imaginary part of equation:

$\mathrm{C0} \to \mathrm{a1} - 2\mathrm{a2}k$

Constraints on coefficients from real part of equation:

$b \to -\frac{2\mathrm{a2}\chi}{A^2}$

$\omega \to -\mathrm{a1}k + \mathrm{a2}k^2 - \mathrm{a2}$

y(z) - function:

$$\frac{4aA}{4a^2e^z + \chi e^{-z}}$$

u(x, t) - function:

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