5. $\dfrac{\partial^2 u}{\partial t^2} = \dfrac{a}{x^n}\dfrac{\partial}{\partial x}\left(x^n \dfrac{\partial u}{\partial x}\right) + u^k f\left(\dfrac{u}{w}\right), \qquad \dfrac{\partial^2 w}{\partial t^2} = \dfrac{b}{x^n}\dfrac{\partial}{\partial x}\left(x^n \dfrac{\partial w}{\partial x}\right) + w^k g\left(\dfrac{u}{w}\right).$

Self-similar solution:

$$u = (C_1 t + C_2)^{\frac{2}{1-k}} y(\xi), \qquad w = (C_1 t + C_2)^{\frac{2}{1-k}} z(\xi), \qquad \xi = \frac{x}{C_1 t + C_2},$$

where C_1 and C_2 are arbitrary constants, and the functions $y = y(\xi)$ and $z = z(\xi)$ are determined by the system of ordinary differential equations

$$C_1^2 \xi^2 y''_{\xi\xi} + \frac{2C_1^2(k+1)}{k-1}\xi y'_\xi + \frac{C_1^2(k+1)}{(k-1)^2} y = \frac{a}{\xi^n}(\xi^n y'_\xi)'_\xi + y^k f\left(\frac{y}{z}\right),$$

$$C_1^2 \xi^2 z''_{\xi\xi} + \frac{2C_1^2(k+1)}{k-1}\xi z'_\xi + \frac{C_1^2(k+1)}{(k-1)^2} z = \frac{b}{\xi^n}(\xi^n z'_\xi)'_\xi + z^k g\left(\frac{y}{z}\right).$$

