Stable manifold of $u = 1$

A. J. Roberts, University of Adelaide
http://www.maths.adelaide.edu.au/anthony.roberts

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The specified dynamical system

$\dot{u}_1 = u_2$

$\dot{u}_2 = \varepsilon^2(u_1^2\alpha - u_1\alpha) + \varepsilon(1/2D_{t,-2c\epsilon}(u_1)u_1^2 - 1/2D_{t,-2c\epsilon}(u_1)u_1 + 1/2u_1^2c - 1/4u_1^2) - u_2c - 1/2u_1c + 1/4u_1$

Centre subspace basis vectors

$\vec{e}_1 = \left\{\{1, -1/2\}\,,\, e^{(iti}/2)\right\}$

$\vec{z}_1 = \left\{\{(c-1/2)/(c-1), 1/(c-1)\}\,,\, e^{(iti}/2)\right\}$

The centre manifold

$u_1 = e^{(iti}/2)s_1 + e^{(3iti}/2)s_1^3\varepsilon(-1/2\cosh(c\epsilon) + 1/2\sinh(c\epsilon))/(c-2) + e^{iti}s_1^2\varepsilon(2\cosh(c\epsilon) - 2\sinh(c\epsilon) - 2c + 1)/(2c-3)$

$u_2 = -1/2\,e^{(iti}/2)s_1 + e^{(3iti}/2)s_1^3\varepsilon(3/4\cosh(c\epsilon) - 3/4\sinh(c\epsilon))/(c-2) + e^{iti}s_1^2\varepsilon(-2\cosh(c\epsilon) + 2\sinh(c\epsilon) + 2c - 1)/(2c-3)$

Centre manifold ODEs

$\dot{s}_1 = (- s_1\varepsilon^2\alpha)/(c-1)$