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ASYMPTOTIC AND NUMERICAL ANALYSIS OF THE BUCKLING PROBLEM FOR A CYLINDRICAL SHELL

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We study the eigenvalue problem associated to the elastic buckling of circular cylindrical shells. We focus on the lowest eigenvalue corresponding to the critical load and analyze it as a function of the shell thickness t. We reveal the asymptotic behavior of the respective eigenfunctions (buckling modes), and show how the different displacement components and portions of the strain energy scale in t.

It turns out that the minimum eigenvalue can be characterized by several different scalings which may lead to different kinds of numerical locking phenomena. Comprehensive numerical testing utilizing accurate higher order finite elements are included and different boundary conditions are analyzed.

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