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On singularity of the UCM and Oldroyd-B models in viscoelastic fluids: resolving the high-Weissenberg number problem[1] RHO SHIN MYONG, Gyeongsang National University — Most of methods based on the UCM and Oldroyd-B models in viscoelastic fluids are found to break down at a frustratingly low value of the Weissenberg number around We=1. The rigorous explanation for this mysterious break-down has remained elusive until recently. In this work, the nature of mathematical singularity of these classical models is first elucidated by considering shear, compression, and extension flows. Then a regularization method based on the Rayleigh-Onsager quadratic dissipation function is proposed in order to resolve the high-Weissenberg number problem. In particular, the exact reason why the extensional flow suffers the break-down in high-Weissenberg number cases is explained. In addition, the relationship of the regularized model to other constitutive models such as the Giesekus and the Phan-Thien-Tanner equations is illustrated.

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