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An investigation of the symmetry and singularity properties of classes of third-order fluid problems

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Abstract. Several classes of nonlinear differential equations are studied that feature third-order derivatives and have special connections to models in boundary layer theory. We consider the integrability of the equations, which is intimately linked to the singularity structure of its solutions.

In lieu of this, we apply singularity analysis to these models to demonstrate the utility of the method, not only in testing for integrability, but also to achieve a selection method for the free parameters of the models. In particular, we demonstrate how the effects of integrability requirements imposes constraints on the equation.

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