On the Role of Semi-Inverse Solution in Mechanics

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Abstract

Semi-inverse solution techniques play a central role in mechanics. In using the semi-inverse approach, one seeks solutions of a particular class for the deformation or flow of the material under consideration, the forces (tractions) that are necessary to engender such a deformation or flow are computed áposteriori after a solution of the form sought has been determined. Of course one is not guaranteed of finding solutions of the form that is sought. Most of the well known exact solutions that are established in mechanics are semi-inverse solutions. In fact, semi-inverse solutions play an important role in modeling as one is interested in picking models that allow solutions of a certain class namely those that correspond to a particular experiment to be possible. For example, inhomogeneous deformations are not possible in all compressible homogeneous isotropic elastic bodies. Usually semi-inverse solutions greatly simplify the governing equations thereby making the equations amenable to analysis, for instance the governing non-linear partial differential equations may reduce to non-linear or linear partial differential equations of lower order or to non-linear or linear ordinary differential equations.