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Abstract:	We studied the fluid mechanics equations (ideal, viscous, superfluid) as the hydro- dynamic expansion of conserved and broken symmetry variables. In particular,how the additional terms for first order hydrodynamics are added in the zeroth-order hy- drodynamics. We have also studied the relativistic version of these hydrodynamics equations so that there is no superluminal flow in the fluids. We have studied sound as the perturbation around a static background solution of the equation of motions and the viscous correction to the sound modes. We have studied the perturbative ef- fect of dissipative terms in the sound modes of zeroth-order hydrodynamics and have found that these correction terms are continually decaying in time, i.e., first order hydrodynamics is stable in the limit those terms are sufficiently small as compared to zeroth-order terms. We have studied the hydrodynamics of stars at equilibrium. We have studied the AdS/CFT correspondence to study a strongly coupled hydrodynamical system like a neutron star. Since perturbative methods cannot be applied to a strongly coupled system, we have used AdS/CFT correspondence, a holographic theory, to extract the equations of state of those strongly coupled systems. We can use those in the hydrodynamics equation to get sensible answers.
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