Abstract Submitted
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Deformations of a pre-stretched and lubricated finite elastic membrane driven by non-uniform external forcing[1] EVGENIY BOYKO, AMIR GAT, MORAN BERCOVICI, Technion - Israel Institute of Technology — We study viscous-elastic dynamics of a fluid confined between a rigid plate and a finite pre-stretched circular elastic membrane, pinned at its boundaries. The membrane is subjected to forces acting either directly on the membrane or through a pressure distribution in the fluid. Under the assumptions of strong pre-stretching and small deformations of the elastic sheet, and by applying the lubrication approximation for the flow, we derive the Green's function for the resulting linearized 4th order diffusion equation governing the deformation field in cylindrical coordinates. In addition, defining an asymptotic expansion with the ratio of the induced to prescribed tension serving as the small parameter, we reduce the coupled Reynolds and non-linear von-Karman equations to a set of three one-way coupled linear equations. The solutions to these equations provide insight onto the effects of induced tension, and enable simplified prediction of the correction for the deformation field.

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