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Bounds on flow rate and friction factor in pressure-driven flow through helical pipes[1] ANUJ KUMAR, University of California, Santa Cruz — We obtain a lower bound on the flow rate and an equivalent upper bound on the friction factor for flow through a helical pipe driven by a pressure differential in the limit of high Reynolds number using the well-known background method. We obtain these bounds as a function of geometrical parameters, i.e., the curvature and the torsion of the pipe, by considering a two-dimensional background flow with varying boundary layer thickness along the circumference of the pipe. We compare our findings with available experimental data. Finally, we present a sufficient criterion for the applicability of the background flow to pressure-driven flow and surface-velocity-driven flow problems.

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