Magnetic traps in 2 dimensions

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Abstract: We study the motion of a charged particle in a bounded region in the plane under the influence of a magnetic field. We show that as long as the field diverges to infinity "fast enoug" at the boundary, the particle cannot reach the boundary in finite time. As a corollary we obtain that the magnetic flow of the field is complete. We then analyze a completely integrable example for which the classical system is complete but it's analogous quantum system is not.