

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Stability of relative equilibria of three vortices¹ HASSAN AREF²,
Technical University of Denmark — Three point vortices on the unbounded plane have relative equilibria wherein the vortices either form an equilateral triangle or are collinear. While the stability analysis of the equilateral triangle configurations is straightforward, that of the collinear relative equilibria is considerably more involved. The only comprehensive analysis available in the literature, by Tavantzis & Ting [*Phys. Fluids*, **31**, 1392 (1988)], is not easy to follow nor is it very physically intuitive. The symmetry between the three vortices is lost in this analysis. A different analysis is given based on explicit formulae for the three eigenvalues determining the stability, including a new formula for the angular velocity of rotation of a collinear relative equilibrium. A graphical representation of the space of vortex circulations is introduced, and the resultants between various polynomials that enter the problem are used. This approach adds considerable transparency to the solution of the stability problem and provides more physical understanding. The main results are summarized in a diagram that gives both the stability or instability of the various collinear relative equilibria and their sense of rotation.

¹Supported by the Danish National Research Foundation through a Niels Bohr Visiting Professorship

²Permanent address: ESM Dept., Virginia Tech

Hassan Aref
Virginia Tech

Date submitted: 21 Jul 2009

Electronic form version 1.4