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Gareth E Roberts* (groberts@radius.holycross.edu), Dept. of Mathematics and CS, College of the Holy Cross, 1 College Street, Worcester, MA 01610, and **Julianne Kulevich** and **Christopher J. Smith**. *The Planar, Circular, Restricted Four-Body Problem*. Preliminary report.

An interesting case of the Newtonian four-body problem arises when one infinitesimal body interacts with three larger ones (primaries) fixed at the vertices of a rotating equilateral triangle. This problem, the planar, circular, restricted four-body problem (PCR4BP), can be characterized by a special potential function V . We analyze the number and location of the critical points of V (equilibria) as a function of the masses of the three primaries. A version of Saari's conjecture, that the only solutions to the Newtonian n -body problem with a constant total size are rigid rotations, is also investigated for the PCR4BP. Techniques from computational algebraic geometry are employed such as Gröbner bases, resultants and BKK theory. (Received September 20, 2007)