Tiancheng Ouyang and Zhifu Xie* (zxie@vsu.edu), Department of Math. & Computer Science, P.O.Box 9068, Virginia State University, Petersburg, VA 23806. Number of Central Configurations in the Collinear Four-body Problem.

For a given \( m = (m_1, m_2, \ldots, m_n) \in (\mathbb{R}^+)^n \), let \( p \) and \( q \in (\mathbb{R}^d)^n \) be two central configurations for \( m \). Then we call \( p \) and \( q \) geometrically equivalent and write \( p \sim q \) if they differ by a rotation followed by a scalar multiplication as well as by a permutation of bodies. Denote by \( L(n, m) \) the set of geometric equivalence classes of \( n \)-body collinear central configurations for any given mass vector \( m \). There are other different understandings of equivalence of central configurations in collinear \( n \)-body problem. Under the usual definition of equivalence of central configurations in history, permutations of the bodies are not allowed and we call them permutation equivalence. In this case Euler found three collinear central configurations and Moulton generalized to \( n! / 2 \) central configurations for any given mass \( m \) in the collinear \( n \)-body problem under permutation equivalence. The main result in this paper is the discovery of the explicit parametric expressions of the union \( H_4 \) of the singular surfaces in the mass space \( m \in (\mathbb{R}^+)^4 \). We prove that the number of central configurations \( \#L(4, m) = 4! / 2 - 1 = 11 \) if \( m_1, m_2, m_3 \) and \( m_4 \) are mutually distinct and \( m \in H_4 \). (Received August 06, 2010)