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Order and chaos in the rotation and revolution of two massive line segments MAGGIE LANKFORD, JOHN LINDNER, The College of Wooster — As a generalization of Newton's two body problem, we explore the dynamics of two massive line segments interacting gravitationally. The extension of each line segment or slash (/) provides extra degrees of freedom that enable the interplay between rotation and revolution in an especially simple example. This slash-slash (//) body problem can thereby elucidate the dynamics of non-spherical space structures, from asteroids to space stations. Fortunately, as we show, Newton's laws imply exact algebraic expressions for the force and torque between the slashes, and this greatly facilitates analysis. The diverse dynamics include a stable synchronous orbit, families of unstable periodic orbits, generic chaotic orbits, and spin-orbit coupling that can unbind the slashes. In particular, retrograde orbits where the slashes spin opposite to their orbits are stable, with regular dynamics and smooth parameter spaces, while prograde orbits are unstable, with chaotic dynamics and fractal parameter spaces.

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