

15.2: Summary

We'll begin by stating Kepler's laws, then apply Newton's Second Law to motion in a central force field. Writing the equations vectorially leads easily to the conservation laws for angular momentum and energy.

Next, we use Bernoulli's change of variable $u = 1/r$ to prove that the inverse-square law gives conic section orbits.

A further vectorial investigation of the equations, following Hamilton, leads naturally to an unsuspected *third* conserved quantity, after energy and angular momentum, the Runge Lenz vector.

Finally, we discuss the rather surprising behavior of the momentum vector as a function of time.

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