Celestial Mechanics and the Restricted 3-Body Problem

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1   Introduction

The advent of calculus by Newton was accompanied by two major breakthroughs in the realm of physics: gravity, and celestial mechanics. To map the movement of the stars was the business of Brahe and Kepler, some 80 years before Newton's groundbreaking *Principia*, which kickstarted the modern field of celestial mechanics. Kepler's Laws and Newton's Laws of Motion form the backbone of the study of mechanics, and Newton's Law of Universal Gravitation provides a basic framework for working with celestial bodies.

Newton's Second Law of Motion states

$$\sum \vec{F} = m\ddot{\vec{r}}$$

Where $\ddot{r}$ represents the acceleration vector