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A Walk through Einstein's General Theory of Relativity

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A WALK THROUGH EINSTEIN'S GENERAL THEORY OF RELATIVITY

Zack Weinstein

Mentor: Quo-Shin Chi

Einstein's general theory of relativity postulates that matter and energy curve and contort the geometry of space and time. A proper understanding of Einstein's theory utilizes the remarkable power of tensors in constructing generally covariant physical laws. In this thesis, we first establish tensor analysis and differential geometry as the mathematical framework for general relativity. We then derive and discuss the uniqueness of Einstein's field equations in four dimensional spacetime, and finally showcase several special solutions of the field equations, including the Schwarzschild metric and gravitational waves.