

The Fourier Series

Ryan Martin

Advisor: Dr. Kathleen Fick

What is the Fourier Series?

- Fourier Series is a method for representing periodic functions as sums of sines and cosines

Applications

- Engineering
- Physics
- Computer Graphics

History

- First developed by Jean-Baptiste Fourier in the early 19th Century while trying to solve differential equations which describe heat flow through solids
- Initially rejected by his peers due to lack of rigorous proof
- Proven and expanded upon by other mathematicians like Dirichlet in the mid-19th Century
- Found widespread use in the areas of signal processing and computer graphics

Impact

- Allowed for a better understanding of periodic phenomena
- Gave scientists and engineers the mathematical tools they need to develop modern technologies



Fig. 1: Jean-Baptiste Joseph Fourier. Credit: O'Connor and Robertson, 1997

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$$

Fig 2. General Form of the Fourier Series

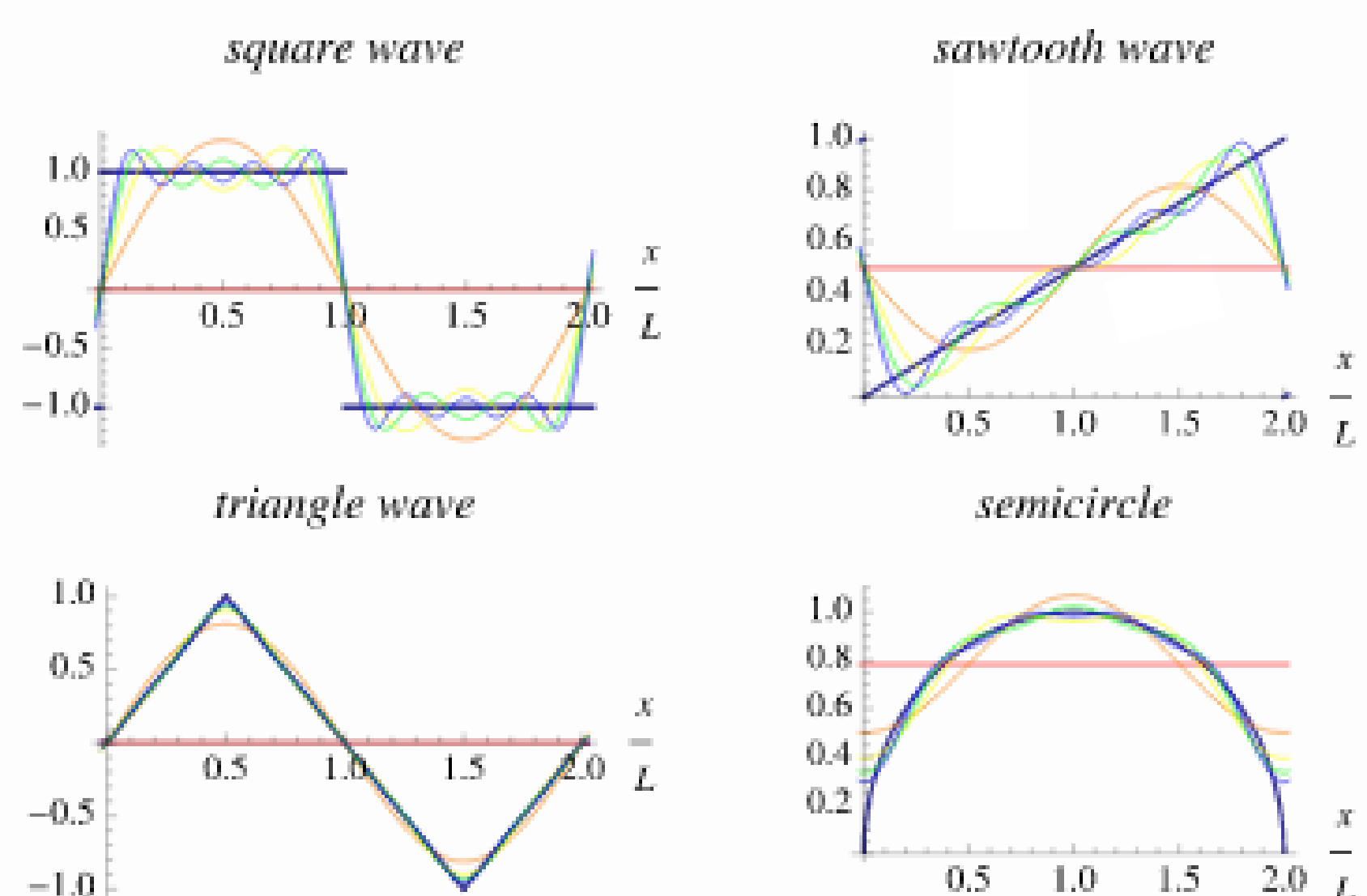


Fig 3. Fourier Series Representations of Various Functions. Credit: Weisstein, Eric W. "Fourier Series" from Wolfram MathWorld

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