

# DIFFERENTIAL EQUATIONS

Andrew Marshall, Ph.D.

Ithaca College

Saturday, January 27<sup>th</sup>

9am-12pm

Science Building - S131

Free Lunch at 12:00!!

## FOURIER SERIES

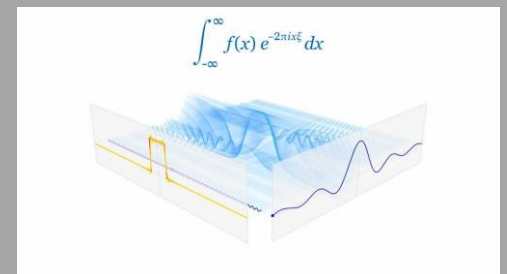
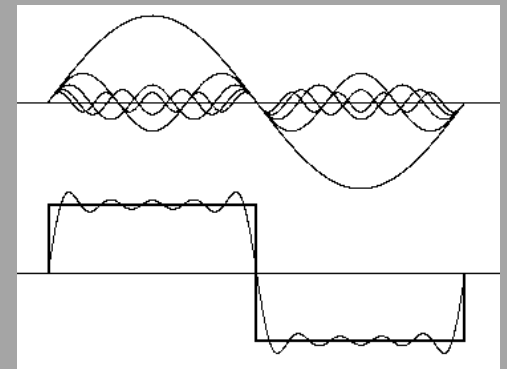
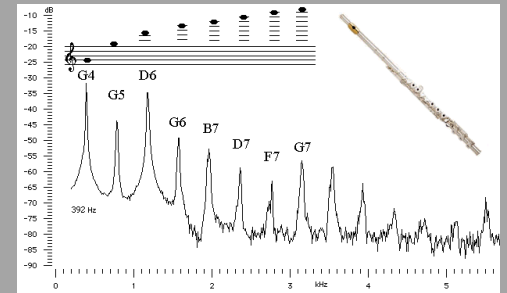


The idea of a Fourier series is to breakdown a wave into a sum of pure tones (sinusoids). The most surprising thing about Fourier series is that with very mild hypotheses on a wave (even most discontinuous waves!) there is such a decomposition. This result has some curious physical consequences, but also gives a tool for solving a class of differential equations which are common in electrical, acoustic and digital signal processing.

In this workshop, I will begin with basics in linear algebra to try to give a bird's eye view of the entire subject of linear algebra. Having laid this foundation, I will demonstrate a linear algebra technique to solve a simple and important family of differential equations. This is the method of Undetermined Coefficients. Finally, I will show what Fourier series are and how they're used to solve differential equations via undetermined coefficients.

This workshop will have plenty of exercises for participants, and will showcase some fascinating things and some useful techniques in differential equations and linear algebra. No background in linear algebra will be assumed.

Dr. Andrew Marshall wrote his thesis on configuration spaces of graphs in the area of algebraic topology. He began his academic career at Cabrillo College in 2002, graduated UCSC in 2007 and was doctored in 2014 at Cornell University. He has since taught mathematics at Cornell University and Ithaca College. He is currently picking up the ability to teach computer science as part of a special Master's program at Stanford University.



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