MA364 Video Tutorial Guide

Block 1: Vector Calculus		
Topic	Video Link	Video Description
Calculus Review	Derivative Review Integral Review Parametric Equation Review	A basic review of essential concepts. Understanding derivatives, integrals, and parametric equations is critical in Block 1.
Curl and Divergence	Curl and Divergence Tutorial Example Problem 1 Example Problem 2	An explanation of curl, divergence, and their uses. These videos also explain how to calculate a cross product (curl) by hand.
Line Integrals	Line Integrals Part 1 Line Integrals Part 2 Line Integration Example Problem	An introduction to line integrals, and a visual representation of what a line integral actually is. Includes a very simple example problem.
Path Independence	What is Path Independence? Condition 1 for Path Independence Condition 2 for Path Independence Condition 3 for Path Independence	An introduction to path independence and its uses. The last three videos explain the different conditions for path independence.
Green's Theorem	What is Green's Theorem? Applications of Green's Theorem In a Conservative Vector Field In a Non-Conservative Vector Field	A brief explanation of Green's Theorem, and its application to line integrals. There are two included examples of Green's Theorem and vector fields.
Surface Integrals	What is a Surface Integral? Surface Integral Example 1 Surface Integral Example 2	A description of surface integrals and their uses. The examples show how to evaluate the surface integral, and what the result means.
Stokes' Theorem	What is Stokes Theorem? Stokes Theorem Example Part 1 Stokes Theorem Example Part 2 Stokes Theorem Example Part 3	The final answer to the example problem can be found here. The first video gives a simple, compact definition of Stokes Theorem, and a simple example problem.
Triple Integrals and Divergence Theorem	Triple Integral Review Divergence Theorem Divergence Theorem Example	The video set provides a review of triple integrals, and explains Divergence Theorem and its uses. There is an example included.

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Block 2: Ordinary Differential Equations		
Topic	Video Link	Video Description
Complex Numbers, Exponential and Logarithmic Equations	Multiplying and Dividing with Imaginary Numbers What is a Complex Number? Complex Numbers as Coordinates	These videos explain how to perform simple mathematical functions with complex numbers, and how to visualize them as coordinates on a plane.
1st Order Linear Models	What is a First Order ODE? First Order Homogenous First Order Non-homogenous	These videos give an introduction to ordinary differential equations. They also explain the difference between homogenous and non-homogenous equations.
Undetermined Coefficients	Solving by Undetermined Coefficients Undetermined Coefficients Example 1 Undetermined Coefficients Example 2	An introduction to solving ODEs by Undetermined Coefficients. Two example problems with solutions are included.
Nonlinear Equations Taylor Series	What is a Taylor Series? Taylor Series Example	These videos give a brief explanation of what a Taylor Series is, and how to apply it.
Spring Mass Systems Circuit Response	Spring Mass Example Problem Circuit Example Problem	Guides for solving the Spring Mass ODE and the Circuit ODEs.
Definition of the Laplace Transform	Laplace Transform Part 1 Laplace Transform Part 2 Laplace Transform Example	An introduction to Laplace Transforms. The first two videos explain Laplace Transforms, and the third is an example problem.
Inverse Laplace Transforms, Transforms of Derivatives	Inverse Laplace Transform Transform of Derivatives Solving DE's with Laplace Transforms	Tutorials on Inverse Laplace Transforms, and Transforms of Derivatives. An example problem for Laplace Transforms is also included.
Translation Theorems Unit Step Functions	Translation Theorems Unit Step Functions Translation Example, Unit Step Example	An introduction to Translation Theorems, and Unit Step Functions. Examples for both are also included.
Dirac Delta Functions	Dirac Delta Function Laplace Transform of the Dirac Delta Function Dirac Delta Function Example	These videos give an introduction to the Dirac Delta function, and show how it applies to Laplace Transforms. Example problem included.

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Block 3: Partial Differential Equations		
Topic	Video Link	Video Description
Orthogonal Functions	What is an Orthogonal Function? Orthogonal Function Example 1 Orthogonal Function Example 2	An explanation and several examples of Orthogonal Functions. The concepts in these videos introduce the Fourier Series.
Fourier Series, Cos/Sin Series, Half Range Expansions	Fourier Series Explained Fourier Series Visualized Cos/Sin Series Half Range Expansions	The videos in this section describe several different types of Fourier Series, including sine and cosine series, and half range expansions. A visualization of the Fourier Series is also included.
Partial Differential Equations, Separation of Variables	Partial Differential Equations Separation of Variables Separation of Variables Example	This section provides an introduction to Partial Differential Equations, and shows how to solve them using Separation of Variables.
1-D Heat Equation	What is a 1-D Heat Equation? Solving the Heat Equation by Separation of Variables 1 Solving the Heat Equation by Separation of Variables 2	These videos demonstrate how to solve a 1-D Heat Equation and other similar Partial Differential Equations using Separation of Variables.
1-D Wave Equation	What is a 1-D Wave Equation? Wave Equation Characteristics General Solution for the Wave Equation Wave Equation: Separation of Variables	These videos demonstrate how to solve a 1-D Wave Equation and other similar Partial Differential Equations using Separation of Variables.