Vector Calculus with Linear Algebra

Course Information 2019-2020

Course Description

Vector Calculus applies the techniques of single variable calculus to functions of multiple variables. We begin by studying vectors in two, three, or more dimensions, and learning how to graph in three dimensions. We study maps from one dimensional space into two or three dimensional space; these model the motion of a particle. Next we learn about maps from two or three dimensional space into one dimensional space. Finally, we will address vector fields, which attach a vector to each point in a plane or in space.

Linear Algebra studies vector spaces, which are flat spaces of higher dimension, and linear transformations between vector spaces. A function $f : \mathbb{R}^n \to \mathbb{R}^m$ is differentiable if it is approximately linear; we will learn that this means that f may be represented by an approximating matrix near each point of differentiability.

Teacher: Dr. Paul L. Bailey

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Book: *Thomas' Calculus*, 11$^{\text{th}}$ edition, Weir, Hass, Giordano, ISBN: 978-0321185587

Book: *Linear Geometry*, lecture notes by Paul Bailey

Grade Components

Classwork:	10%
Homework:	10%
Quizzes:	20%
Exams:	60%

Classwork consists of participation in discussion, and activities such as team quizzes, worksheets, and other group work. Classwork activities are normally be graded on a scale of zero to ten.

Homework exercises from the textbook will be routinely, to be due at the beginning of the next class period. Homework assignments will be graded on a scale of zero to ten.

Quizzes are about twenty minutes long and occur almost every week, normally on Wednesday, covering the previous week's worth of material. These will be graded on a scale of zero to ten.

Exams are hour long assessments and are cumulative in nature. We will have about three exams per trimester. These will be graded on a scale of zero to one hundred points.

Homework is normally computational in nature; more complex problems may be assigned as take-home quizzes or exams.

Course Outline

Trimester	Week	Monday	Unit	Topic	Thomas	Bailey
1	1	08/05/19	Sets	Sets, Set Operations, Standard Sets		S 1.1-1.4
1	2	08/12/19	Sets	Euclidean Space, Graphing, Loci	S 12.1	
1	3	08/19/19	Sets	Functions		S 1.5, 1.6
1	4	08/26/19	Vectors	Vectors in $\mathbb{R}^n$	S 12.2	S 2.1-2.11
1	5	09/02/19	Vectors	Dot and Cross Product	S 12.3, 12.4	S 2.12-2.13
1	6	09/09/19	Vectors	Lines and Planes in $\mathbb{R}^2$ and $\mathbb{R}^3$	S 12.5	S 3.1-3.6
1	7	09/16/19	Vectors	Conic Sections	S 10.1, 10.2	
1	8	09/23/19	Vectors	Quadric Surfaces	S 12.6	
1	9	09/30/19	Vectors	Review	S 13.1-13.3	
		10/07/19		Fall Break		
1	10	10/14/19	Paths	Maps $\mathbb{R} \to \mathbb{R}^n$	S 13.1-13.2	
2	11	10/21/19	Paths	Tangent, Normal, Binormal	S 13.3-13.5	
2	12	10/28/19	Partials	Maps $\mathbb{R}^n \to \mathbb{R}$	S 14.1, 14.2	
2	13	11/04/19	Partials	Partial Derivatives, Chain Rule	S 14.3, 14.4	
2	14	11/11/19	Partials	Directional Derivatives, Gradients	S 14.5	
2	15	11/18/19	Partials	Extrema	S 14.7	
2	16	11/25/19	Linear Algebra	Hyperplanes in $\mathbb{R}^n$		S 3.7-3.11
2	17	12/02/19	Linear Algebra	Vector Spaces in $\mathbb{R}^n$		S 4.1-4.5
2	18	12/09/19	Linear Algebra	Linear Transformations $\mathbb{R}^n \to \mathbb{R}^m$		S 4.6-4.10
2	19	12/16/19	Linear Algebra	Direct Sums		S 6.2
		12/24/19		Winter Break		
		12/31/19		Winter Break		
2	20	01/06/20	Matrix Algebra	Matrices and Composition		S 5.1
2	21	01/13/20	Matrix Algebra	Gaussian Elimination		S 5.2
2	22	01/20/20	Matrix Geometry	Basis for Kernel and Image		S 6.1
2	23	01/27/20	Matrix Geometry	Four Fundamental Subspaces		S 6.3
3	24	02/03/20	Topics	Topics		
3	25	02/10/20	Topics	Topics		
3	26	02/17/20	Topics	Topics		
3	27	02/24/20	Topics	Topics		
3	28	03/02/20	Topics	Topics		
		03/09/20		Spring Break		
3	29	03/16/20	Topics	Topics		
3	30	03/23/20	Topics	Topics		
3	31	03/30/20	Topics	Topics		
3	32	04/06/20	Topics	Topics		
3	33	04/13/20	Topics	Topics		
3	34	04/20/20	Topics	Topics		
3	35	04/27/20	Topics	Topics		