

# MATH 2415: Calculus 3

## Timothy Lo, Dallas College, Fall 2024

<b>1</b>	<b>Vectors and the Geometry of Space</b>	<b>2</b>
1.1	Vectors in the Plane . . . . .	2
1.2	Vectors in Three Dimensions . . . . .	2
1.3	Dot Products . . . . .	2
1.4	Cross Products . . . . .	2
1.5	Lines and Planes in Space . . . . .	2
1.6	Cylinders and Quadric Surfaces . . . . .	2
<b>2</b>	<b>Vector-Valued Functions</b>	<b>3</b>
2.1	Vector-Valued Functions . . . . .	3
2.2	Calculus of Vector-Valued Functions . . . . .	3
2.3	Motion in Space . . . . .	3
2.4	Length of Curves . . . . .	3
2.5	Curvature and Normal Vectors . . . . .	3
<b>3</b>	<b>Functions of Several Variables</b>	<b>4</b>
3.1	Graphs and Level Curves . . . . .	4
3.2	Limits and Continuity . . . . .	4
3.3	Partial Derivatives . . . . .	4
3.4	The Chain Rule . . . . .	4
3.5	Directional Derivatives and the Gradient . . . . .	4
3.6	Tangent Planes and Linear Approximation . . . . .	4
3.7	Maximum/Minimum Problems . . . . .	4
3.8	Lagrange Multipliers . . . . .	4
<b>4</b>	<b>Multiple Integration</b>	<b>5</b>
4.1	Double Integrals over Rectangular Regions . . . . .	5
4.2	Double Integrals over General Regions . . . . .	5
4.3	Double Integrals in Polar Coordinates . . . . .	5
4.4	Triple Integrals . . . . .	5
4.5	Triple Integrals in Cylindrical and Spherical Coordinates . . . . .	5
4.6	Integrals for Mass Calculations . . . . .	5
4.7	Change of Variables in Multiple Integrals . . . . .	5
<b>5</b>	<b>Vector Calculus</b>	<b>6</b>
5.1	Vector Fields . . . . .	6
5.2	Line Integrals . . . . .	6
5.3	Conservative Vector Fields . . . . .	6
5.4	Green's Theorem . . . . .	6
5.5	Divergence and Curl . . . . .	6
5.6	Surface Integrals . . . . .	6
5.7	Stokes' Theorem . . . . .	6
5.8	Divergence Theorem . . . . .	6

# **1 Vectors and the Geometry of Space**

## **1.1 Vectors in the Plane**

## **1.2 Vectors in Three Dimensions**

## **1.3 Dot Products**

## **1.4 Cross Products**

## **1.5 Lines and Planes in Space**

## **1.6 Cylinders and Quadric Surfaces**

## **2 Vector-Valued Functions**

### **2.1 Vector-Valued Functions**

### **2.2 Calculus of Vector-Valued Functions**

### **2.3 Motion in Space**

### **2.4 Length of Curves**

### **2.5 Curvature and Normal Vectors**

# **3 Functions of Several Variables**

**3.1 Graphs and Level Curves**

**3.2 Limits and Continuity**

**3.3 Partial Derivatives**

**3.4 The Chain Rule**

**3.5 Directional Derivatives and the Gradient**

**3.6 Tangent Planes and Linear Approximation**

**3.7 Maximum/Minimum Problems**

**3.8 Lagrange Multipliers**

## **4 Multiple Integration**

**4.1 Double Integrals over Rectangular Regions**

**4.2 Double Integrals over General Regions**

**4.3 Double Integrals in Polar Coordinates**

**4.4 Triple Integrals**

**4.5 Triple Integrals in Cylindrical and Spherical Coordinates**

**4.6 Integrals for Mass Calculations**

**4.7 Change of Variables in Multiple Integrals**

# **5 Vector Calculus**

**5.1 Vector Fields**

**5.2 Line Integrals**

**5.3 Conservative Vector Fields**

**5.4 Green's Theorem**

**5.5 Divergence and Curl**

**5.6 Surface Integrals**

**5.7 Stokes' Theorem**

**5.8 Divergence Theorem**