

**Department of Mathematics, University of Toronto**  
**MAT291H1F - Calculus III**  
**Schedule and Suggested Problems – 2016**

The lecture schedule described below is applicable to Lecture Section 2. The schedule for Lecture Section 1 and Lecture Section 3 is one lecture ahead of Lecture Section 2, on a weekly basis, but by the end of the last week of term they will be aligned with Lecture Section 2.

Your ability to correctly and completely solve the problems listed below is a very good indicator of your progress with the material. You are expected to solve at the very minimum all of the problems on this list and most of the problems in the Supplementary Notes. The course is rather compressed so there will be instances where some material (text and supplementary notes) will be left as a reading assignment.

**Week 1** beginning September 8

**Lecture: Introduction**

Review Supplementary Notes: MAT291F Vector Review Problems

**Week 2** beginning September 12 **Tutorials begin. (Quiz 0: MAT291 Vector Review problems)**

**Lectures:**

Chapter 13: Functions of Several Variables

13.1 Planes and Surfaces (**Lect 1**)

13.2 Graphs and Level Curves (**Lect 2**)

13.3 Limits and Continuity (**Lect 3**)

**Section 13.1:** 3, 5, 11, 13, 17, 23, 29, 35, 45, 47, 51, 55, 59, 63, 67, 79, 83, 91, 95, 101

**Section 13.2:** 3, 15, 19, 29, 38, 41, 45, 47, 51, 75

**Section 13.3:** 7, 9, 11, 15, 19, 25, 27, 29, 31, 33, 35, 45, 49, 55, 59, 61, 65, 75, 77, 79, 82

**Week 3** beginning September 19 (**Quiz 1: 13.1, 13.2**)

**Lectures:**

13.3 Limits and Continuity (continued) (**Lect 4**)

13.4 Partial Derivatives (**Lect 5**)

13.5 The Chain Rule (**Lect 6**)

**Section 13.4:** 1, 7, 13, 21, 29, 31, 37, 43, 49, 51, 53, 69, 71, 75, 79, 79, 81, 83, 86, 89

**Section 13.5:** 3, 7, 15, 17, 19, 31, 33, 41, 48, 51, 53, 55, 57, 61

**Week 4** beginning September 26 (**Quiz 2: 13.3, 13.4, 13.5**)

**Lectures:**

13.6 Directional Derivatives and the Gradient (**Lect 7**)

13.7 Tangent Planes and Linear Approximation (**Lect 8**)

Chapter 14: Multiple Integration

### 14.1 Double Integrals over Rectangular Regions (**Lect 9**)

**Section 13.6:** 3, 4, 5, 11, 15, 19, 25, 27, 31, 37, 41, 43, 49, 57, 59, 63, 77, 78

**Section 13.7:** 3, 5, 13, 21, 27, 33, 37, 47, 55, 61, 62, 63

**Section 14.1:** 1, 7, 11, 21, 29, 33, 37, 38, 41, 47, 51, 59

**Week 5** beginning October 3 (**Quiz 3: 13.6, 13.7, 14.1**)

#### **Lectures:**

14.2 Double Integrals over General Regions (**Lect 10**)

14.7 Change of Variables in Multiple Integrals: Mapping of Region and Jacobian (**Lect 11**)

14.7 Change of Variables in Multiple Integrals: Methodology and Examples (**Lect 12**)

**Section 14.2:** 5, 7, 11, 23, 29, 31, 35, 41, 48, 55, 57, 59, 63, 67, 71, 77, 85, 87, 89

**Section 14.7:** 7, 9, 15, 19, 25, 27, 29, 33, 35, 39, 41, 47, 49, 61.

**Week 6** beginning October 10 (**No tutorials or quizzes this week**)

#### **Lectures:**

14.3 Double Integrals in Polar Coordinates (**Lect 13**)

14.4 Triple Integrals (**Lect 14**)

14.5 Triple Integrals in Cylindrical Coordinates (**Lect 15**)

**Section 14.3:** 3, 5, 9, 11, 25, 31, 35, 43, 51, 59, 65, 67, 71

**Section 14.4:** 4, 5, 13, 17, 23, 27, 33, 37, 43, 45, 49, 55, 57, 59

**Week 7** beginning October 17 (**Quiz 4: 14.2, 14.7**)

#### **Lectures:**

14.5 Triple Integrals in Spherical Coordinates (**Lect 16**)

Chapter 15: Vector Calculus

15.2 Line Integrals of Scalar Functions (**Lect 17**)

15.1 Vector Fields (**Lect 18**)

**Section 14.5:** 9, 10, 13, 15, 17, 21, 25, 31, 37, 41, 43, 49, 51, 55, 57, 65, 74, 81

**Chapter 14 Review (page 1066):** 3, 7, 13, 17, 19, 25, 31, 35, 37, 43, 47, 49, 53, 61, 67, 75, 77, 79

**Section 15.1:** 2, 7, 11, 16, 19, 23, 33, 41, 48, 49

**Week 8** beginning October 24 (**Quiz 5: 14.3, 14.5**)

#### **Lectures:**

15.2 Line Integrals of Vector Fields (**Lect 19**)

15.3 Conservative Vector Fields (**Lect 20**)

15.5 Divergence and Curl (**Lect 21**)

**Section 15.2:** 1, 3, 13, 17, 23, 27, 29, 31, 35, 39, 47, 55, 57, 59, 63, 65

**Section 15.3:** 1, 3, 7, 11, 19, 23, 27, 29, 36, 39, 41, 47, 49, 53, 55

**Week 9** beginning Oct 31 (**midterm on Wednesday November 2 from 6:10-8 pm covers everything up to and including the end of Section 14.5): No quiz this week**

**Lectures:**

15.5 Equivalence Principles and Vector Identities (**Lect 22**)

15.4 Green's Circulation and Flux Theorem (**Lect 23**)

15.4 Green's Theorem for Problematic Regions (**Lect 24**)

**Section 15.4:** 1, 8, 9, 13, 19, 27, 29, 37, 43, 46, 47, 51, 53, 59, 60, 61

**Section 15.5:** 3, 6, 11, 15, 19, 21, 23, 29, 33, 39, 43, 47, 57, 58, 59, 61

**Week 10** beginning November 7 (**Quiz 6: 15.3, 15.5**)

**Lectures:**

15.6 Surface Integrals: Scalar functions with surface parameterization (**Lect 25**)

15.6 Surface Integrals: Scalar functions with explicit representation and vector fields (**Lect 26**)

15.8 Introduction to Divergence and Stoke's Theorem (Supplementary Notes): Exploiting Symmetry and Superposition in Vector Calculus Problems (**Lect 27**)

**Section 15.6:** 3, 7, 11, 13, 19, 21, 25, 29, 33, 37, 41, 43, 45, 53, 55, 59, 69, 73

**Week 11** beginning November 14 (**Quiz 7: 15.4, 15.6**)

**Lectures:**

15.8 Divergence Theorem and Supplementary Notes: Exploiting Symmetry and Superposition in Vector Calculus Problems: Divergence Theorem (**Lect 28**)

Supplementary Notes: Exploiting Symmetry and Superposition in Vector Calculus Problems: Divergence Theorem: (**Lect 29**)

15.8 Divergence Theorem and Method for Handling Hollow Regions (**Lect 30**)

**Section 15.8:** 1, 3, 9, 11, 17, 21, 27, 29, 31, 35, 39, 47, 48, 49, 50, 51, 53

Problems in Supplementary Notes on Exploiting Symmetry and Superposition in Vector Calculus Problems: Divergence Theorem

**Week 12** beginning November 21 (**Quiz 8: 15.8 and Supplementary Notes on Exploiting Symmetry and Superposition in Vector Calculus Problems: Divergence Theorem**)

**Lectures:**

15.7 Stoke's Theorem and Supplementary Notes: Exploiting Symmetry and Superposition in Vector Calculus Problems: Stoke's Theorem (**Lect 31**)

Supplementary Notes: Exploiting Symmetry and Superposition in Vector Calculus Problems: Stoke's Theorem: (**Lect 32**)

Chapter 14: Functions of Several Variables

13.8 Max/Min Problems (**Lect 33**)

**Section 15.7:** 1, 3, 5, 9, 13, 15, 19, 25, 29, 37, 38, 39, 40, 41, 43, 46

Problems in Supplementary Notes on Exploiting Symmetry and Superposition in Vector Calculus Problems: Stoke's Theorem

**Week 13** beginning November 28 (**Quiz 9: 15.7 and Supplementary Notes on Exploiting Symmetry and Superposition in Vector Calculus Problems: Stoke's Theorem**)

**Lectures:**

13.9 Lagrange Multipliers: 2 variables 1 constraint (**Lect 34**)

13.9 Lagrange Multipliers: 3 variables with 1 or 2 constraints (**Lect 35**)

13.9 Lagrange Multipliers Example (**Lect 36**)

**Section 13.8:** 3, 4, 8, 11, 13, 21, 25, 33, 36, 39, 35, 47, 49, 51, 53, 55, 57, 59, 61, 73

**Section 13.9:** 1, 5, 11, 21, 23, 27, 29, 33, 42, 47, 49, 61, 63

**Chapter 15 Review (page 1167):** 1, 2, 5, 7, 9, 13, 21, 25, 29, 31, 33, 37, 39, 45, 51, 56, 57, 59, 63, 65

**Week 14** beginning December 5 (no tutorial or quiz this week)

**Lectures:**

Review of Course up to the Midterm

Review of Course after the Midterm and Final Exam Preparation