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# Multivariable Calculus

Math 212 §2 Fall 2014  
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Fowler 309 MWF 11:45am - 12:40pm  
<http://faculty.oxy.edu/ron/math/212/14/>

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## Worksheet 29

**TITLE** The Last Day of Class!

**CURRENT READING** McCallum, Chapter 12, Chapter 13, Chapter 14, Chapter 15, Chapter 16 (Not 16.6), Chapter 17 (Not 17.4), Chapter 18, Section 19.3 and Section 20.1

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### SUMMARY

This worksheet reviews the concepts that you need to be responsible for on the Final Exam.

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Here are the titles of the Worksheets in this class.

**\* means Final Exam will not cover this material**

- Worksheet 1** *Introduction to Vectors (Notation and Terminology)*
- Worksheet 2** *The Dot Product and Vector Equations of Lines and Planes*
- Worksheet 3** *Vector Projection and the Vector Cross Product*
- Worksheet 4** *Functions, Vector Functions, and  $f(x, y)$  as surfaces*
- Worksheet 5** *Cross-Sections and Level Sets*
- Worksheet 6** *Limits of Multivariable Functions*
- Worksheet 7** *The Partial Derivative*
- Worksheet 8** *The Tangent Plane, Differentials, and Linear Approximations*
- Worksheet 9** *The Directional Derivative and the Gradient Vector*
- Worksheet 10** *The Gradient Vector in  $\mathbb{R}^3$*
- Worksheet 11** *The Chain Rule*
- Worksheet 12** *Second-Order Partial Derivatives*
- Worksheet 13** *Review for Exam 1*
- Worksheet 14** *Differentiability of a Multivariable Function*
- Worksheet 15** *Local Extrema of a Multivariable Function*
- Worksheet 16** *(Unconstrained) Optimization of a Multivariable Function*
- Worksheet 17** *Multivariable Constrained Optimization (Using Lagrange Multipliers)*
- Worksheet 18** *(Integration of a Multivariable Function*
- Worksheet 19** *Iterated Integration*
- Worksheet 20** *Triple Integrals*
- Worksheet 21** *Evaluating Multiple Integrals Using Other Coordinate Systems*
- Worksheet 22** *The Calculus of Curves In Space*
- Worksheet 23** *Review for Exam 2*
- Worksheet 24** *Vector Fields and Line Integrals*
- Worksheet 25** *Gradient Fields and Path-independent Vector Fields*
- Worksheet 26** *Green's Theorem and the Scalar Curl*
- Worksheet 27** *The Divergence and Curl and Introduction To Vector Calculus*
- Worksheet 28** *The Three Fundamental Theorems of Vector Calculus\**

Here are the list of in-class activities

- Surface Activity 1** *The Surface (Functions of Two Variables)*
- Surface Activity 2** *The Park (Level Sets)*
- Supplemental Activity** *Matching Contours and Surfaces*
- Surface Activity 3** *The Hillside (The Gradient Vector)*
- Surface Activity 4** *The Water Table (Constrained Multivariable Optimization)*

Here are the titles of the Take-Home Quizzes in the class

- Quiz 1** *Vectors and Lines in  $\mathbb{R}^4$*
- BONUS 1** *Planes and the Cross Product*
- Quiz 2** *Multivariable Functions*
- Quiz 3** *Application of Partial Derivatives*
- BONUS 2** *Understanding Partial Derivatives*
- Quiz 4** *Gradient Vector and Directional Derivatives*
- Quiz 5** *Extreme Values of Surfaces*
- Quiz 6** *Constrained Multivariable Optimization*
- Quiz 7** *Iterated Integration*
- BONUS 3** *Multivariable Optimization Using Lagrange Multipliers*
- Quiz 8** *Triple Integrals*
- Quiz 9** *Line Integrals*
- Quiz 10** *Green's Theorem*

Here are the sections of the book we have covered in the class, *Calculus : Multivariable (6th Edition)*

- Section 12.1** *Functions of Two Variables*
- Section 12.2** *Graphs and Surfaces*
- Section 12.3** *Contour Diagrams*
- Section 12.4** *Linear Functions*
- Section 12.5** *Functions of Three Variables*
- Section 12.6** *Limits and Continuity*
- Section 13.1** *Displacement Vectors*
- Section 13.2** *Vectors in General*
- Section 13.3** *The Dot Product*
- Section 13.4** *The Cross Product*
- Section 14.1** *The Partial Derivative*
- Section 14.2** *Computing Partial Derivatives Algebraically*
- Section 14.3** *Local Linearity and the Differential*
- Section 14.4** *Gradients and Directional Derivatives in the Plane*
- Section 14.5** *Gradients and Directional Derivatives in Space*
- Section 14.6** *The Chain Rule*
- Section 14.7** *Second-Order Partial Derivatives*
- Section 14.8** *Differentiability*
- Section 15.1** *Critical Points*
- Section 15.2** *Optimization*
- Section 15.3** *Constrained Optimization: Lagrange multipliers*
- Section 16.1** *Definite Integral Of A Function of Two Variables*
- Section 16.2** *Iterated Integrals*
- Section 16.3** *Triple Integrals*
- Section 16.4** *Double Integrals in Polar Coordinates*
- Section 16.5** *Integrals in Cylindrical or Spherical Coordinates*
- Section 17.1** *Parametrized Curves*
- Section 17.2** *Motion, Velocity and Acceleration*
- Section 17.3** *Vector Fields*
- Section 18.1** *The Idea of a Line Integral*
- Section 18.2** *Computing Line Integral Over Parametrized Curves*
- Section 18.3** *Gradient Fields and Path-Independent Fields*
- Section 18.4** *Green's Theorem and Path-dependent Fields*
- Section 19.3** *The Divergence of a Vector Field*
- Section 20.1** *The Curl of a Vector Field*

GROUPWORK
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What topic(s) are the most unclear right now?

Which topic(s) do you have the most confidence in answering questions on?