The following provides a list of concepts that you should be familiar with for the second midterm. Although this list is intended to cover as much as possible, you should also refer to lecture notes and homework (both written and online) for an idea of what you may be expected to know. For some topics, additional exercises are provided which you may choose to work through in order to help yourself prepare for the exam. Some of these are a duplication of assigned homework problems which are intended to better emphasize what you might be expected to do while others are new and intended to provide additional opportunity for practice. In addition to reviewing examples done in lecture and assigned as homework, this will provide you with a solid understanding of concepts which may be tested. However, you may be asked to apply understanding of these concepts in new ways on the exam, so it is important that you master the underlying concepts and fully understand the motivation of each step of the solution in addition to knowing how to solve the exercises you review.

14.1 The partial derivative
- Definition and notation of partial derivatives
- Estimating partial derivatives
- Interpretation of units in word problems
- Comparison of magnitude of partial derivatives
14.1 #1, 3, 4, 7, 11, 13, 22, 23, 26

14.2 Computing the partial derivatives algebraically
- Compute partial derivatives
- Graphical interpretation
14.2 #5, 7, 25, 39, 41, 43

14.3 Local linearity and the differential
- Local linearity
- Formula for tangent plane
- Tangent plane approximation at a point
- Estimating tangent plane from graph or table
- Estimate the change of a function
14.3 #1, 3, 21, 23, 25

14.4 Gradients and directional derivatives
- Directional derivative
- Estimate the directional derivative from table or graph
- Gradient
  - 6 properties of the gradient
14.4 #5, 7, 21, 25, 27, 33, 35, 47, 51, 61

14.6 The chain rule
- Calculate the derivative two ways (plug in and use chain rule)
- Use chain rule to calculate derivative at a point
14.6 #1, 9, 17, 19, 29, 35
14.7 Second order partial derivatives
   • Definition and notation
   • Clairaut's theorem
   • Second order taylor approximation
   • Estimating second derivatives from tables and graphs
14.7 #5, 7, 19, 21, 31, 37, 41, 45

15.1 Critical points: local extrema and saddle points
   • Finding critical points
   • Local minimum/maximum
   • Second derivative test
   • Graphical interpretation
15.1 #1, 3, 8, 17, 21, 25, 27

15.2 Optimization
   • Optimization
   • Global min/ max
   • Word problems
   • Statement and hypothesis of extreme value theorem
15.2 #9, 15, 19, 23

15.3 Constrained optimization: Lagrange multipliers
   • Optimization subject to a constraint
   • Graphical picture of optimization
Do not worry about the meaning (or sign) of lamda.
15.3 #5, 7, 18, 25, 31a

Chapter 15 review #13, 21, 25, 26, 28, 39, 49