Final Exam Outline

(Only includes topics from 14.6-8 and Appendix H)

14.6

→ How to compute directional derivatives
  (Remember: Use a unit vector for the direction)
→ Definition of the gradient vector
→ Directional derivative in terms of gradient
→ Maximize & minimize the directional derivative
→ Tangent plane to level surfaces
→ Understand geometric meaning of gradient vector
  (Read pgs. 955-6 3 think about max/min of directional derivative)

14.7

→ Definition of local and absolute maximum and minimum
→ Define and find critical points (Includes case when derivative doesn't exist!)
→ Second derivative test
Local maxima/miniima even when second derivative tests fail. (Example: \( x^4 + y^4 \) if \((x, y) = (0, 0)\), \( x^3 + y^3 \) if \((x, y) = (0, 0)\).)

Know the extreme value theorem (for true/false only)

Know how to compute maximum/minimum of \( f(x, y) \) on a closed, bounded domain \( D \).

(1) Critical pts
(2) Boundary
(3) Compare all values found in (1) and (2)

Practice with example questions from HW/section.

(For instance: #31, #33, #35, #37 have answers in back.)

Know how to apply the method of Lagrange multipliers in 2 or 3 variables with 1 or 2 constraints.

Advanced optional technique: Can use Lagrange multipliers to handle the boundary step (2) in the procedure to find absolute min/max. See Example 3.
Appendix H:

- Compute with complex numbers:
  - Addition, subtraction
  - Multiplication, division
  - Complex conjugation, absolute value.

- Polar form: how to compute with numbers written in polar form, and convert between polar/rectangular form.


Notes:

- For Appendix H and 14.8 the exam question will be nearly identical to a homework problem (with some numbers changed) or in-class example. So learn the HW really well.

- 55% of exam from Midterm 1 and 2 material.
  - 10% from 14.6
  - 15% from 14.7
  - 15% from 14.8
  - 5% from Appendix H

Note: Undercovered areas from Midterm 1 & 2 will be emphasized (e.g. 134.)