REVIEW FOR MATH 196, MIDTERM 2

Here, to help you review, are the main things which will be on the test. It will cover Sections 15.2-15.8 (although of course you’ll need to understand 15.1 for it!). Remember, everything about functions of two or three variables. This sheet is pretty comprehensive, so concentrate on the areas you are least comfortable with!

First, a list of the topics which will be covered.

- Limits and Continuity; definition (in two variables) of limit, evaluating limits and deciding whether a function is continuous, the simple proof for when limits don’t exist, simple cases of the not-so-simple proof when they don’t
- Partial Derivatives; definition and computation, implicit differentiation, Chain Rule, plugging in to check if they satisfy PDEs, uses in gradient and linearization
- Tangent Planes; definition, geometric interpretation, approximation using them, connection to linearization and differentials
- Gradient; definition, use in calculating directional derivative, direction of greatest increase, use in max/min problems
- Max/Min Problems; finding critical points, use of gradient, second derivative test, finding extrema for closed bounded sets, finding extrema when another condition is added (via single variable calculus or Lagrange multipliers)

Problems and examples from the text which are especially important to understand (since there are so many variants possible, realize that these only represent the myriad possibilities in many computational cases - so know all the homework!):

**Chapter 15.2:** Def., p.922; Criterion, p.923; Probs. 8 and 28
**Chapter 15.3:** Def., p.931; Rule, p.932; Probs. 12,39, and 66
**Chapter 15.4:** Defs, pp.943 and 947; Thm., p.946; Probs. 5,12, and 30
**Chapter 15.5:** Thms, pp.952-4; Trick, p.957; Probs. 8 and 37
**Chapter 15.6:** Defs., pp.961 and 964; Thms., pp. 963 and 966; Probs. 7,22, and 35
**Chapter 15.7:** Thms., pp.973-4 and 979; Ex., p.977; Probs. 12 and 29
**Chapter 15.8:** Technique, pp.986 and 989; Probs. 4,17, and 34