REVIEW FOR MIDTERM II

PRELIMINARIES:

The midterm will be given on Wednesday on 24 October in our usual classroom and will be 1 hour. The test is closed-book and closed-note. Calculators are not allowed.

The best preparation for any test is to be diligent and keep up over the weeks preceding the test. The second-best preparation for a math test is to *work* problems – since this is what your test will look like. Working problems should come before: reading and high-lighting your notes, reading and high-lighting the text, "looking over" quizzes and homework.

CHAPTER 14: PARTIAL DERIVATIVES

- Section 1: Functions of Several Variables

  1. terminology: level curves, level surfaces
  2. important ideas: the nature of domain and range for a function of multiple variables, graphing functions of multiple variables especially using level curves or level surfaces,
  3. In particular, you should know how to sketch a contour diagram (or contour map) and how to read a contour diagram.

- Section 2: Limits and Continuity

  1. terminology: $\lim_{(x,y)\to(a,b)} f(x,y)$,
  2. important ideas: how to demonstrate that a limit fails to exist, how we can know that a limit does exist, how we know certain functions are continuous.

- Section 3: Partial Derivatives

  1. terminology: first- (or second- or third-) order partial derivative, f_{xxyz} or $\partial^2 f/\partial x \partial y$,
  2. important ideas and skills: how to find a first-order partial derivative and how to interpret it, especially in the context of an applied problem, how to demonstrate that a particular function does or does not satisfy a particular differential equation.
  3. One may use Clairaut's Theorem though you do not need to know it by name.

- Section 4: Tangent Planes and Linear Approximation

  1. definitions: tangent plane to a surface at a point, linear approximation of a function at a point, the differential (or total differential) of a function
  2. skills: how to find the tangent plane to a surface at a point (NOTE: We now have multiple ways of doing this.), how to find the linear approximation of a function at a point and how to use it, how to find the differential of a function at a point and how to use it.
  3. In particular, you should know how to find and use these things (plane, linear approximation, differential) in the context of an applied problem.

- Section 5: The Chain Rule

    1. skill: Given a function of multiple variables each of which is itself a function of other variables, you should be able to state an appropriate chain rule and to use it.
    2. You may use the Implicit Function Theorem but are not required to do so.

- Section 6: Directional Derivatives and the Gradient Vector

    1. terminology: directional derivative a given direction, gradient
    2. skills: know how to find and interpret a directional derivative in a given direction, know the geometric significance of the gradient and the magnitude of the gradient at a point (summarized in the *Significance of the Gradient Vector* at the end of this section.
    3. Recall that we have an alternate approach to finding tangent planes to surfaces.

- Section 7: Maximum and Minimum Values

    1. terminology: local (absolute) maximum (minimum) for functions of multiple variables, critical points, Second Derivatives Test, closed bounded set.
    2. skills: how to find critical points for a function of two variables, how to use the Second Derivatives Test, how to find absolute extrema for a continuous function on a closed-bounded domain.

- Section 6: Lagrange Multipliers

    1. terminology: Method of Lagrange Multipliers
    2. skill: how to solve a max-min problem using the Method of Lagrange Multipliers

CHAPTER 15.1: Double Integrals over Rectangles

1. terminology: iterated integral, double integral, Riemann sum
2. skills: how to evaluate a double integral (by straight evaluation, by reversing the order of integration, by geometry), how to reverse the order of integration, how to set up and evaluate a double integral to find volume of a solid.