Midterm 3 study guide

- Make sure you can do all the practice problems listed in the notes from chapters 15 and 16.
- Definitions and Theorems you need to know to state and use:

  1. Level curves and contour maps for functions of two variables.
  2. Limits for functions of two variables.
  3. Showing a limit does not exist by approaching from different directions.
  4. Definition of partial derivatives. Statement of Clairaut's theorem.
  5. Definition of "differentiable function".
  6. Tangent plane, using it to approximate values like $\sqrt{2.01^2 + 3.94^2}$.
  7. The gradient, rules for the gradient (including 2 chain rules).
  8. Explanation on why the gradient has to be perpendicular to the level curves.
  9. Directional derivative, definition as a limit and interpretation as a dot product.
  10. Directions of maximum increase and maximum decrease for a function.
  11. Extreme Value Theorem for functions of two or more variables.
  12. Second derivative test for local minima/maxima/saddle points.
  13. Finding the minimum and maximum on a closed and bounded set.
  14. Lagrange Multipliers.
  15. Definition of Integral of function of two variables over a rectangle.
  16. Iterated integrals, Fubini's theorem.
  17. Integral in polar coordinates.
  18. Change of variables for integrals.

- Extra practice problems, from the "Chapter Review Exercises" on pages 862 and 941:

  - 862: 5, 6, 7, 8, 16, 20, 22, 24, 26, 27, 31, 35, 40, 48, 52, 54, 55, 58
  - 941: 3, 5, 6, 10, 12, 15, 17, 18, 24, 58, 60