Guide to Midterm Exam 2

   Try to make up some problems for each of the following. If you can do that, that means you do understand it.

1. Review definitions of limit (ε and δ) and continuity for functions of two or more variables. Review related examples in section 14.2.

2. Review and truly understand the definition of differentiability for functions of two or more variables in section 14.3. Review the relation of differentiability and tangent plan, and the quantitative definition of tangent plane, in particular.

3. Study the relation between Chain rule and differentiability for functions of two or more variables in section 14.4. Practice the chain rule, for example, between Cartesian coordinate (x, y) and polar coordinate (r, θ).

4. Review the definition of the directional derivatives. Practice with some examples.

5. Review the definition and properties of the gradient vector and its relation with tangent and normal line/plane.

6. Review all cases for the method of the Lagrangian multipliers.

7. Review the derivation of Taylor's formula for functions of two or more variables.

8. Review partial derivatives with constrained variables. Practice it, for example, on $PV = nRT$ (with n and R being constants).

9. For multiple integrals, focus on the interchanging between $\int \int dx dy$ and $\int \int dy dx$ when the domain R is not a rectangle. How do you do that?