Study guide for quiz 06 (v02)

Quiz problems include both the lecture contents and homework problems.

1. Section 14.3:

   Study and memorize the definition of differentiability for functions of two or more variables in section 14.3. Study why the four statements (1)-(4) on page 1 of Remark_on_definition_of_differentiability.pdf are identical.

2. Section 14.3:

   Study why differentiability at a point implies continuity at that point (study the proof of Theorem 4). Try to find a function of two variables that is continuous at a point but not differentiable at that point.

3. Section 14.3:

   Study how to evaluate $f_{xy}(0,0)$ and $f_{yx}(0,0)$ for problems like section 14.3, problem 72.

4. Section 14.4:

   Study the Chain rule for composition of differentiable functions of one or more independent variables (along with one or more intermediate variables) such as Theorem 5 (1 independent, 2 intermediate variables), Theorem 6 (1 independent, 3 intermediate variables), Theorem 7 (2 independent, 3 intermediate variables) and so on for more general cases.

5. Section 14.4:

   Study how to evaluate
   $$\frac{d}{dx}\int_{u(x)}^{v(x)} g(t,x)\,dt.$$
   Hint: $= \dfrac{d}{dx}F(u(x),v(x),w(x))$ where $F(u,v,w) = \displaystyle\int_u^v g(t,w)\,dt$.

6. Section 14.5:

   Study the definition of directional derivative and how to compute it from definition, and alternatively how to compute it using partial derivatives when the function is differentiable.

7. Section 14.5:

   Study the geometric meaning of the gradient vector. Study how to find the tangent line and normal line of a level curve of $f(x,y)$ (i.e., $\{(x,y) \mid f(x,y) = c\}$) using gradient of f.