Reading Assignment # 4

Math 13 - Prof. Orellana

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Read Sections 2.3 and 2.4

This is still review from Math 8. Don't forget to give page numbers in the book where you found the answer, remember this is a reading assignment.

1. Define the partial derivative of a scalar function of two variables. Look at figures 2.45 and 2.46 and explain what these pictures mean.

2. Read Example 3 in Section 2.3 and tell me why did we have to use the definition of derivative to compute the partial derivatives at (0,0).

3. Tell me how to compute the equation of the tangent plane at a point (a, b) given a function $f : X \subseteq \mathbb{R}^2 \to \mathbb{R}$. The steps are outlined in page 111, basically I want to know how the formula is derived.

4. What does Theorem 3.3 says?

5. What is the point of Example 4? Read the example and the paragraph after the example to answer this question.

6. How do we define "$f(x, y)$ is differentiable at (a, b)"?

7. Read Theorem 3.5, what does "open" mean? If you don't remember, look in the index and tell me how it is defined and in what page.

8. Let $f : X \subseteq \mathbb{R}^2 \to \mathbb{R}^3$, write the general formula for $Df(x, y)$ and tell me the size of this matrix.

9. State the "Grand definition of Differentiability". What is stronger to say that a function is differentiable at a point $\mathbf{a}$ or to say that all partial derivatives exist at the point $\mathbf{a}$, use the definition to explain your answer. What does it mean to say $\mathbf{h}(\mathbf{x})$ is a "good linear approximation to $\mathbf{f}$ near $\mathbf{a}$".

10. What does ∇f mean? How does this relates to the definition of linear function $F(\mathbf{x}) = A\mathbf{x}$ where A is a constant matrix?

11. Read pages 126-127 and list the properties of the derivative. What does your book say about product rule and quotient rule for functions $f : \mathbb{R}^n \to \mathbb{R}^m$ when $m > 1$?

12. How are the "mixed partial derivatives" and the "k-th partial derivative" defined? What are the conditions that a function must satisfy so that it doesn't matter in which order we do the mixed partial derivatives?