Reading Assignment # 6

Math 13 - Prof. Orellana

January 16, 2009

Read Sections 2.6
Don't forget to let me know the pages where you found the answers.

1. Define the gradient vector ∇f of a function $f : X \subseteq \mathbb{R}^n \to \mathbb{R}$. Give an example when $n = 3$.

2. In Section 2.3 we discussed a geometric interpretation of $\frac{\partial f}{\partial x}(a, b)$ and $\frac{\partial f}{\partial y}(a, b)$, explain these geometric interpretations.

3. What is another way of viewing $\frac{\partial f}{\partial x}(a, b)$ described in Section 2.6? What about $\frac{\partial f}{\partial x}(a, b)$?

4. Write the definition of the directional derivative at a point $\mathbf{a}$ and explain in your own words what you think it means. Can we think of the partial derivatives $\frac{\partial f}{\partial x_i}$ as a directional derivative? Explain.

5. In the paragraphs before Theorem 6.2 they explain how to arrive to Theorem 6.2, what is so "remarkable" about this theorem? What does it say?

6. Read Example 3 and explain what's the point of this example. At the top of page 156 the author says that the function is not continuous at the origin and then in parenthesis (Why?), tell me why.

7. At the bottom of page 156 they explain why we restrict the definition of directional derivative to only unit vectors, explain why.

8. What does theorem 6.3 say? If you were at the top of Mount Washington and you wanted to descend the fastest way in which direction would you go?

9. Why are we revisiting tangent planes? What is the relevancy of Theorem 6.4 to tangent planes?

10. How would you compute the equation of a tangent plane of the surface $F(x, y, z) = c$ using the gradient?