Assignment 10 (10/16)

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This homework is due at the beginning of class on Friday 10/20. *You may cite results from class as appropriate. Unless otherwise stated, you must provide a complete explanation for your solutions, not simply an answer. You are encouraged to work together on these problems, but you must write up your solutions independently.*

You are encouraged to think about the problems marked with a (⋆) if you have time, but you don't need to hand them in.

Remember that you can always use the result of the previous assignment problems without proof to solve the new assignment problems.

Problem 0⋆

Over the third and fourth week we will be covering chapter 14. Try to read the corresponding sections from book everyday after class.

Problem ϵ⋆

Observe the similarity of the following two theorems.

- Gradient of a function of 3 variables is perpendicular to level surface of the function.

- Gradient of a function of 2 variables is perpendicular to the level curves (in its contour plot).

The first is a statement in 3-dimension; the second is in 2−dimensions. These statements can be at least heuristically explained as follows. The value of the function remains constant if we move along a level curve (or surface). So it is reasonable to expect that the function changes most rapidly when we move perpendicular to the level curve (or surface). That tells us the gradient must be perpendicular to the level curve (or surface) since the directional derivative is biggest in the direction of gradient.

Problem 1

Problems 14.6.$(23, 28, 29, 38, 51, 55, 57, 61, 69⋆)$.