Homework 08

1. Section 14.6: Problems 5, 9, 17, 19, 25(b), 55, 57, 58.

   Remark: Suppose that $f(x, y)$ is differentiable at (x_0, y_0). Both "linearization" and "linear approximation" of $f(x, y)$ at (x_0, y_0) refer to the tangent plane of the surface $z = f(x, y)$ at $(x_0, y_0, f(x_0, y_0))$. That is, the plane $z = L(x, y)$ given on page 1 of Lecture 14.

   Problem 55 provides another way of finding the tangent plane $z = L(x, y)$. That is, apply the definition and equation (1) on page 853 to the function $F(x, y, z) = z - f(x, y)$:

   $$\nabla F(x_0, y_0, z_0) \cdot (x - x_0, y - y_0, z - z_0) = 0$$

   Verify that this will lead to the equation $z = L(x, y)$.

2. Section 14.6: Problems 33, 39(a), 45.

   Remark: The formula for "error of linear approximation" will be explained in Lecture 17. See also page 853 and page 859 (item 1 and 2) for generalization to functions of 3 variables.

3. Section 14.7: Problems 1, 19, 39, 43, 49, 51.

   Hint for problem 49, 51: Minimizing/maximizing distance is the same as minimizing/maximizing $(\text{distance})^2$. The latter is easier to compute.