Assignment #8

Due on Wednesday, February 25, 2015

Read Section 12.1, on *Functions of Two Variables,* in Calculus: Multivariable, by McCallum, Hughes–Hallett, Gleason, et al.

Read Section 12.2, on *Graphs of Functions of Two Variables,* in Calculus: Multivariable, by McCallum, Hughes–Hallett, Gleason, et al.

Read Section 12.3, on *Contour Diagrams,* in Calculus: Multivariable, by McCallum, Hughes–Hallett, Gleason, et al.

Read Section 12.4, on *Linear Functions,* in Calculus: Multivariable, by McCallum, Hughes–Hallett, Gleason, et al.

Do the following problems

1. The expression $f(x, y) = 2 - \sqrt{4 - x^2 - y^2}$ defines a function of two variables

   (a) Give the domain of f.

   (b) Sketch a few of the contour curves: $f(x, y) = c$; indicate values of values c for which contour curves exist.

   (c) Sketch the graph of f.

2. Let $f \colon \mathbb{R}^2 \to \mathbb{R}$ be defined by

$$f(x, y) = 4 - x^2 - y^2, \quad \text{for all } (x, y) \in \mathbb{R}^2.$$

   (a) Give the domain of f.

   (b) Sketch a few of the contour curves of the graph of f.

   (c) Sketch the graph of $z = f(x, y)$.

3. Let $f \colon \mathbb{R}^2 \to \mathbb{R}$ be defined by

$$f(x, y) = 4 - 3x - 2y, \quad \text{for all } (x, y) \in \mathbb{R}^2.$$

   (a) Give the domain of f.

   (b) Sketch a few of the contour curves of the graph of f.

   (c) Sketch the graph of $z = f(x, y)$.

4. Suppose that f is a linear function of x and y that has slope 2 in the x direction and slope 3 in the y–direction.

   (a) Determine the change in $z = f(x, y)$ that a change of 0.5 in x and a change of -0.4 in y produces.

   (b) If $f(5, 7) = 2$, determine the value of $z = f(x, y)$ when $x = 4.9$ and $y = 7.2$.

5. The graph of a linear function f is a plane passing through the point $(4, 3, -2)$ in three–dimensional space $\mathbb{R}^3$, and having slope 5 in the x–direction and slope -3 in the y–direction.

   (a) Determine a formula for computing $f(x, y)$ for all $(x, y) \in \mathbb{R}^2$.

   (b) Sketch contour lines for the function f.