Math 2153 – Recitation 8 October 22, 2015

1. Suppose $f(2,1,1) = 4$, $f_x(2,1,1) = -3$, $f_y(2,1,1) = 2$ and $f_z(2,1,1) = 6$. Estimate $f(2.1, 0.9, 1.2)$.

2. Find an equation for the tangent plane to the graph of the function

$$f(x,y) = y^x$$

   at the point $(1,2,2)$.

3. Find the maximum and minimum values of

$$f(x,y,z) = x^2 + y^2 + z^2$$

   subject to the constraint $xyz = 4$.

4. Find the line of the form

$$y = mx + b$$

   which best fits the data points $(1,2)$, $(3,5)$ and $(4,6)$ in that it minimizes the sum of the squares of the vertical distances of the data points to the line.

5. Suppose that z is an implicit function of x and y satisfying $F(x,y,z) = 0$. Show that

$$\frac{\partial z}{\partial x} = -\frac{F_x}{F_z} \qquad \text{and} \qquad \frac{\partial z}{\partial y} = -\frac{F_y}{F_z}.$$

6. Prove the product rule for the gradient

$$\nabla(fg) = (\nabla f)g + f(\nabla g)$$

   where f and g are functions of three variables.