

Calculus III: Project 3

Due date: Thursday, 14 Mar 13

Instructions: On your own paper, solve the following problems in a clean, neat, clear, organized, legible, *etc* manner. Your assignment will be graded on the presentation and validity of your work.

1. Use a $\delta - \varepsilon$ argument to verify that the limit exists.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{5xy^2}{x^2 + y^2}.$$

(Hint: You'll want to find the limit along some path first.)

2. Verify that the function $u = 1/\sqrt{x^2 + y^2 + z^2}$ is a solution of the three-dimensional Laplace equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0.$$

3. Find the differential df and the equation of the linearization of the function $f(x, y, z) = x^3 \sqrt{y^2 + z^2}$ at the point $(2, 3, 4)$, and use it to approximate the number $(1.98)^3 \sqrt{(3.01)^2 + (3.97)^2}$.