

Homework 2

Due January 26th in class or by 3:20 pm in MATH 602.

1. Let $f(x, y) = 3x^2 + y^2$. Sketch the graph of f , as well as some of its level sets and sections.
2. Let $f(x, y) = \max(x, y)$. Sketch the graph of f , as well as some of its level sets and sections.
3. For each of the following functions, find the limit as $(x, y) \rightarrow (0, 0)$ using the squeeze theorem or polar coordinates, or show that the limit does not exist.

(a)

$$\frac{5xy}{2x^2 + 3y^2}$$

(b)

$$\frac{5x^2y^2 \log(x^2 + y^2 + 2)}{2x^2 + 3y^2}$$

(c)

$$\frac{x^2y^4e^y \cos x}{x^4 + y^8}$$

It may be helpful to look at §3.2.5 of these notes http://ksuweb.kennesaw.edu/~plaval/math2203/funcnD_limcont.pdf

4. Evaluate the partial derivatives of

$$f(x, y) = \begin{cases} 0, & \text{if } (x, y) = (0, 0), \\ \frac{x^2y^3}{x^4 + y^6}, & \text{if } (x, y) \neq (0, 0). \end{cases}$$

with respect to x and y at $(0, 0)$. Is f differentiable at $(0, 0)$? Explain your answer.

5. Find the tangent plane at $(1, 2)$ to the graph of $f(x, y) = x^2 + 2y^2 + 1$. Where does this plane intersect the z axis?