

Math 53 Discussion Problems Oct 1

1. For each of the following functions, sketch some of its level curves, then try to sketch its graph.

(a) $f(x, y) = 1 - |x| - |y|$

(b) $f(x, y) = \frac{1}{4x^2 + y^2}$

(c) $f(x, y) = x^2 - y$

2. For each of the following functions, sketch some of its level surfaces.

(a) $f(x, y, z) = x + z$

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

(c) $f(x, y, z) = \frac{x - y + z}{2x + y - z}$

3. Compute the following limits (Hint: some of these may not exist)

(a) $\lim_{(x,y) \rightarrow (3,4)} \sqrt{x^2 + y^2 - 1}$

(b) $\lim_{(x,y) \rightarrow (1,-1)} \frac{x^3 + y^3}{x + y}$

(c) $\lim_{(x,y) \rightarrow (1,1)} \frac{xy^2 - 1}{y - 1}$

(d) $\lim_{(x,y) \rightarrow (0,0)} y \sin\left(\frac{1}{x}\right)$

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

(f) $\lim_{(x,y) \rightarrow (0,0)} \frac{\sin(x^2 + y^2)}{x^2 + y^2}$