MATH 104: WORKSHEET 16

1. Concepts

Definition 1.1. A *closed set* is one that contains all of its boundary.
A *bounded set* is one that is contained in some disk.

Theorem 1.2 (Extreme Value Theorem for functions of two variables)**.** *If f is continuous on a closed, bounded set D in $\mathbb{R}^2$, then f attains an absolute maximum value $M = f(x_1, y_2)$ and an absolute minimum value $m = f(x_1, y_2)$ in D.*

Theorem 1.3. *To find the absolute maximum and minimum values of a continuous function f on a closed, bounded set D:*

1. *Find the values of f at the critical points of f in D.*
2. *Find the extreme values of f on the boundary of D.*
3. *The largest of the values from steps 1 and 2 is the absolute maximum value; the smallest of these values is the absolute minimum value.*

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2. Discussions

Problem 2.1. Find absolute max/min values of the function

$$f(x, y) = x^2 - 2xy + 2y$$

on the rectangle $D = \{(x, y) \mid 0 \leqslant x \leqslant 3, 0 \leqslant y \leqslant 2\}$.

Problem 2.2. Find the shortest distance from the point $(2, 0, -3)$ to the plane $x + y + z = 1$.