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Problems

Q1. Draw the level curves of f for the given values of c.

(a) $f(x, y) = x^3 - y$ for $c = -1, 0, 1$.

(b) $f(x, y) = y - 2\ln(x)$ for $c = -3, 0, 3$.

(c) $f(x, y) = y\csc(x)$ for $c = 0, 1, 2$.

(d) $f(x, y) = x/(x^2 + y^2)$ for $c = -2, 0, 4$.

Q2. (a) Sketch the level curves of $f(x, y) = 4 - 3x + 2y$ for $c = -1, -2, -3, 0, 1, 2, 3$.

(b) Produce a seperate sketch of the graph $z = f(x, y)$ in three-dimensional space.

Q3. Describe the graph of $f(x, y) = \max(|x|, |y|)$ by computing some level sets of the function. The function $\max(a, b)$ returns the maximum of its two arguments; for example, $\max(-3, 2) = 2$.

Q4. Consider the following piecewise function,

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

(a) Compute the limit as $(x, y) \to (0, 0)$ along the path $x = 0$.