

14.1 Group work

14.1: Functions of multiple variables

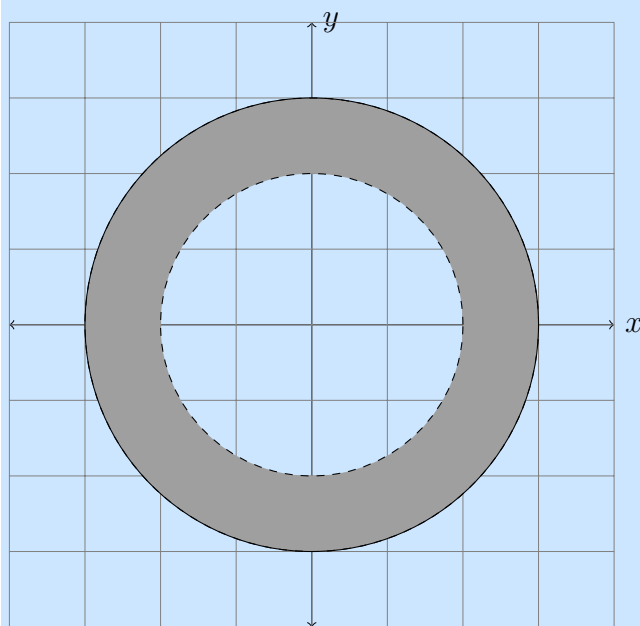
1. Find and sketch the domain of $f(x, y) = \frac{\sqrt{9 - x^2 - y^2}}{\sqrt{x^2 + y^2 - 4}}$

Solution: The domain for this function is everywhere that

$$9 - x^2 - y^2 \geq 0 \quad \text{and} \quad x^2 + y^2 - 4 > 0$$

which is equivalent to

$$x^2 + y^2 \leq 9 \quad \text{and} \quad x^2 + y^2 > 4$$



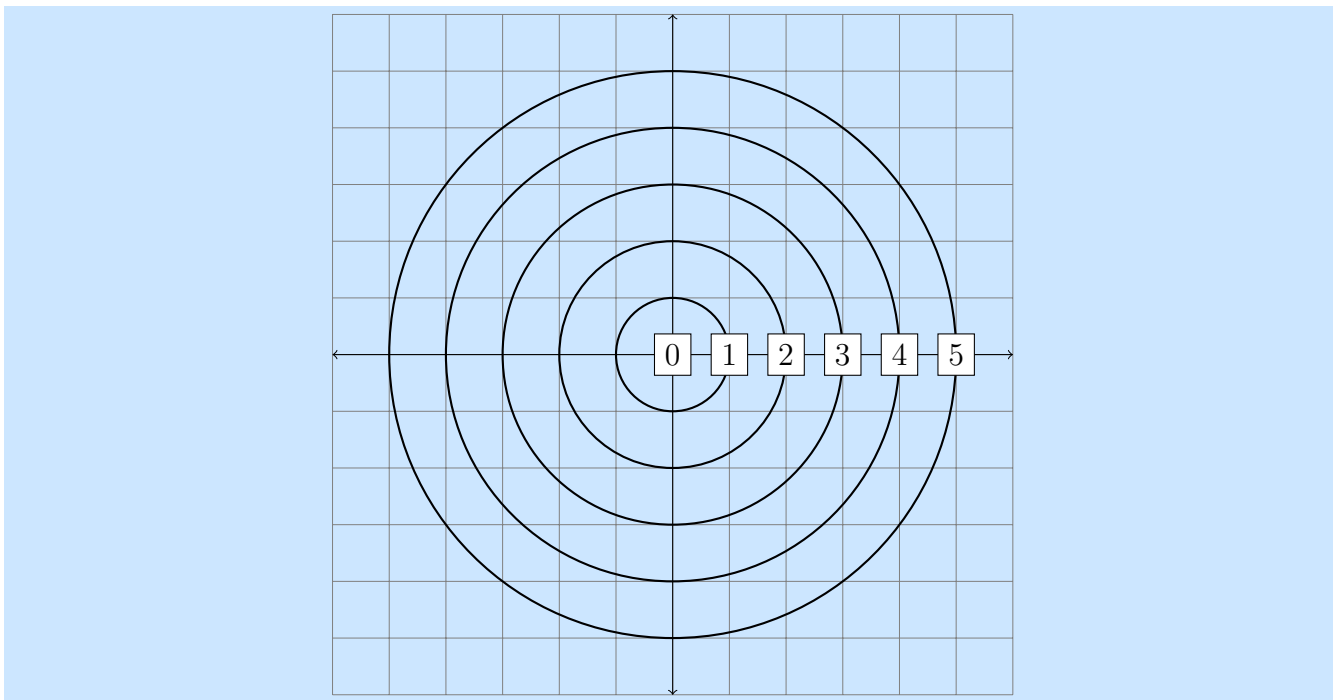
2. Let $f(x, y) = \sqrt{x^2 + y^2}$.

(a) What is the domain of $f(x, y)$?

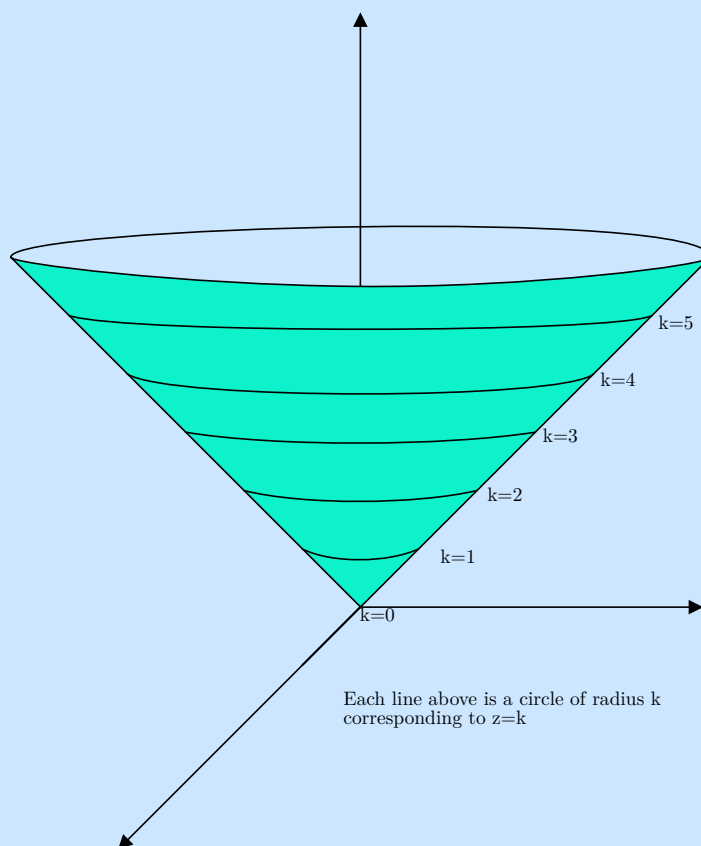
Solution: $f(x, y)$ is defined as long as $x^2 + y^2 \neq 0$, which means everywhere except the point $(0, 0)$, i.e. $\{(x, y) \in \mathbb{R}^2 \mid (x, y) \neq (0, 0)\}$.

(b) Sketch a contour plot for $f(x, y)$ using level curves $f(x, y) = k$ for $k = 0, 1, 2, 3, 4, 5$.

Solution:



- (c) Use the above to sketch $f(x, y)$. Illustrate the curves corresponding to curves drawn in the contour plot above.



Solution: