

Question 1

Let

$$f(x, y) = \frac{\sqrt{9 - x^2 - y^2}}{\ln(x - y)}.$$

Tasks

1. Determine the exact domain.
2. State which boundary curves are included or excluded.
3. Test $(2, 0)$, $(0, 0)$, and $(1, 0)$ for membership.

Question 1 – Solution

Strategy Enforce separately the square-root, logarithm, and nonzero-denominator conditions.

Step 1: Square root Real values require $9 - x^2 - y^2 \geq 0$, hence $x^2 + y^2 \leq 9$.

Step 2: Logarithm The logarithm requires $x - y > 0$. Because it is a denominator, $\ln(x - y) \neq 0$, so $x - y \neq 1$.

Step 3: Combine Therefore

$$D = \{(x, y) : x^2 + y^2 \leq 9, x > y, x - y \neq 1\}.$$

The circular boundary is included only where the other restrictions hold; $x = y$ and $x - y = 1$ are excluded.

Step 4: Test points $(2, 0)$ satisfies all conditions. $(0, 0)$ fails $x > y$. $(1, 0)$ makes the denominator $\ln 1 = 0$. Thus only $\boxed{(2, 0)}$ belongs to D .