

Math 1451, Honor Calculus Practice5, Spring 2016.

February 12, 2016

PSID: _____ Name: _____

Definition. Let f be a function of two variables whose domain D includes points arbitrarily close to (a, b) . Then we say that the limit of $f(x, y)$ as (x, y) approaches (a, b) is L and we write

$$\lim_{(x,y) \rightarrow (a,b)} f(x, y) = L$$

if for every number $\varepsilon > 0$ there is a corresponding number $\delta > 0$ such that if $(x, y) \in D$ and $0 < \sqrt{(x - a)^2 + (y - b)^2} < \delta$ then $|f(x, y) - L| < \varepsilon$.

1. If $f(x, y) = \frac{3x^2y}{x^2 + y^2}$, does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exist?

2. If $f(x, y) = \frac{xy}{x^2 + y^2}$, does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exist?

3. If $f(x, y) = \frac{\sin(x^2 + y^2)}{x^2 + y^2}$, does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exist?

4. If $f(x, y) = \frac{\sin(x^2 - y^2)}{x^2 + y^2}$, does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exist?