

Solution

Math 230 quiz No. 5, Oct. 13, Name:

, Student ID:

Announcement: Final exam conflict filing period: Oct. 9th - Oct. 22nd.

(1) (2 points) Find the domain and range of the function f :

$$f(x, y) = e^{\sqrt{z-x^2-y^2}}$$

$e^{-\sqrt{z-x^2-y^2}}$ is defined when $z-x^2-y^2 \geq 0 \Rightarrow z \geq x^2+y^2$

Domain: $D = \{(x, y, z) \mid z \geq x^2+y^2\}$

Since $\sqrt{z-x^2-y^2} \geq 0$ we have $e^{\sqrt{z-x^2-y^2}} \geq 1$

Range: $R = [1, \infty)$

(2) (2 points) Find the limit, if it exists, or show that the limit does not exist.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{xy \cos y}{3x^2 + y^2}$$

On the x -axis, $f(x, 0) = 0$ for $x \neq 0$

So $f(x, y) \rightarrow 0$ as $(x, y) \rightarrow (0, 0)$ along x -axis

Along line $x = y$, $f(x, y) = \frac{1}{4} \cos x$ for $x \neq 0$

so $f(x, y) \rightarrow \frac{1}{4}$ along this line.

\Rightarrow limit does not exist.