

Show all your work for full credit. Unsupported answers = reduced points. Use a separate sheet of paper if necessary. Clearly indentify your answers.

1. Given the function  $f(x, y) = e^{\sqrt{9-x^2-y^2}}$
- Find the domain of the function.
  - Describe the level curves for  $f$ .
  - Find the largest (maximum) and smallest (minimum) level curve possible.

[ /3]

- 
2. Determine which limits exist or do not exist. If the limit exists, find its value:

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

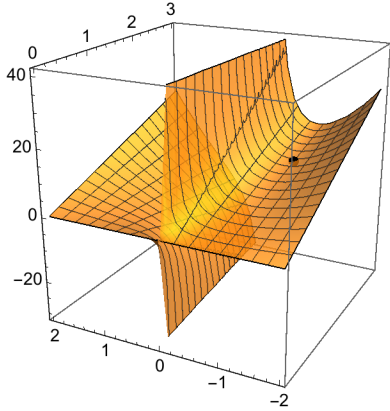
b)  $\lim_{(x,y) \rightarrow (2,1)} \frac{x^2-4y^2}{3x^2-6xy}$

[ /4]

- 
3. Prove that  $\lim_{(x,y) \rightarrow (0,0)} \frac{xy^3}{x^2+2y^6}$  doesn't exist.

[ /2]

4. Find the slopes of the surface in the  $x$  direction and the  $y$  direction on the surface  $f(x, y) = 2xy^2 - 3\frac{x}{y}$  at the points  $(2, -1, 10)$



[ /2]

---

5. Find the equation of the tangent line to the surface at the point in given in #4 on the plane  $y = -1$ .

[ /2]

---

6. Find the equation of the tangent plane to the surface  $f(x, y) = x^2y - 2xy + 2y^2$  when  $x = 2$ , and  $y = 3$

[ /2]

---