Math 283 Quiz 5 Section 1: Oct 10

Name: Sato

If you cannot complete a problem (perhaps because you forgot a formula) but you think you know how, please describe. Correct methods will receive partial credits.

1. The level curves of \( f(x, y) = x^2 - y \) have which of the following shapes?
   (multiple-choice)
   (a) parabolas
   (b) hyperbolas
   (c) circles
   (d) lines

2. Show that the following limit does not exist:
   \[
   \lim_{(x,y) \to (0,0)} \frac{2xy}{x^2 + 2y^2}
   \]
   Path 1: \( x = 0 \) \quad \Rightarrow \quad f(x, y) = 0.
   Path 2: \( y = x \) \quad \Rightarrow \quad f(x, y) = \frac{2x^2}{x^2 + 2x^2} = \frac{2x^2}{3x^2} = \frac{2}{3}.

   Since along two paths \( f(x, y) \) approaches different values, the limit does not exist.

3. Level curves are shown for a function \( f \). Determine whether following partial derivatives are positive or negative at the point \( P \).
   (a) \( f_x > 0 \) (\#s increase to right)
   (b) \( f_y < 0 \) (\#s decrease upward)

   \( P \) is \((2, 0)\)