NAME:_____   ID:_____

Instruction: Answer ALL TWO questions and show your work with explanation.

Question 1: Let $f : \mathbb{R}^3 \to \mathbb{R}$ be the function defined by

$$f(x, y, z) = xz + y^2.$$

(a) (6 points) Describe the level surface $L_0 := \{f(x, y, z) = 0\}$. Is it a cylinder, an ellipsoid, a paraboloid, a hyperboloid or a cone? Find a change of coordinates to put it in standard form: i.e. $Au^2 + Bv^2 + Cw^2 + Du + Ev + Fw + G = 0$.

Answer:

(b) (8 points) Find the intersection of L_0 with the plane $z = x + y + 1$. Is it an ellipse, hyperbola or parabola? Explain clearly your answer.

Answer:

(continued)

Question 2: (6 points) Evaluate the following limit or explain why the limit does not exist:

$$\lim_{(x,y)\to(0,0)} \frac{|y|}{\sqrt{x^2 + y^2}}.$$

Answer: