MA 242 TEST # 1 Name: _____
January 30, 1997 SS #: _____
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1. (10 pts) Find the equation of the plane that passes through the three points $(0, 3, 0)$, $(0, 2, 1)$, and $(-3, 0, 4)$. $\mathbf{-x - 3y + 9 - 3z = 0}$

2. (10 pts) Find an equation for the plane containing the line in the xy-plane defined by $y = 3x + 1$, and the point $(1, 0, 3)$. $\mathbf{-3x - 1 + y + \frac{4z}{3} = 0}$

3. (10 pts each) Identify the surfaces of the following equations. Sketch the surfaces and give their appropriate names:

   (a) $x^2 - y^2 + z = 1$. **hyperbolic paraboloid (shifted one unit in z direction)**

   (b) $x = y^2 + z^2$. **elliptic paraboloid (open to the positive x direction)**

   (c) $x^2 - y^2 + z^2 = 0$. **cone (open along the y-axis)**

   (d) $x^2 - y^2 - z^2 = 1$. **elliptic hyperboloid with two sheets (open to the x direction)**

   (e) $2x + 3y + z = 6$. **plane**

4. (10 pts) Describe in your own words *why* we want to consider level curves or contour diagrams. Use the function $f(x, y) = y - x^2$ to illustrate your points.

5. (10 pts) Decompose the vector $\vec{b} = [2, 3, -1]$ into a sum $\vec{b_1} + \vec{b_2}$, where $\vec{b_1}$ is parallel to $\vec{a} = [0, 4, 2]$ and $\vec{b_2}$ is orthogonal to $\vec{a}$. $\mathbf{\vec{b_1} = [0, \frac{56}{20}, \frac{28}{20}], \vec{b_2} = [2, \frac{4}{20}, \frac{-8}{20}]}$

6. (10 pts) Calculate the angle BAC at vertex A of the triangle with vertices $A = (2, 2, 2)$, $B = (4, 2, 1)$, and $C = (2, 3, 1)$. $\arccos \mathbf{\frac{1}{\sqrt{10}}}$