Quiz #6 **Name:** ____________________

MA 234-51 **18 February 1993**

The following problems are to be turned in on February 25 at the beginning of class.

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1. Answer *yes* or *no* and explain in detail your reasoning: *(1 point each)*
   (a) If $f(x, y)$ has first partial derivatives at a point, it must be continuous at that point.
   (b) If $f(x, y)$ is continuous at a point, then it must have first partial derivatives at that point.
   (c) If $f(x, y)$ is continuous at a point, then it must be differentiable at that point.
   (d) If $f_x(x, y)$ and $f_y(x, y)$ both exist at a point and are continuous in a neighborhood of that point, then the limit of $f(x, y)$ exists at that point.

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2. A right circular cone has height and base radius changing over time so that the radius is increasing at a rate of 1 meter per second and the height is decreasing at a rate of 2 meters per second. Use the chain rule to find the rate of change of the volume when the base radius is 5 meters and the height is 10 meters. *(5 points)*

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3. Find an equation of the tangent plane to the surface given by $x^2 - y^2 - z^2 = 1$ at the point $(3, 2, 2)$. *(5 points)*

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4. Let $f(x, y) = 2y^3 - 3x^4 - 6x^2y + 1$. Find all the stationary points for f and classify them according to type. *(5 points)*