Math 53 Quiz 4

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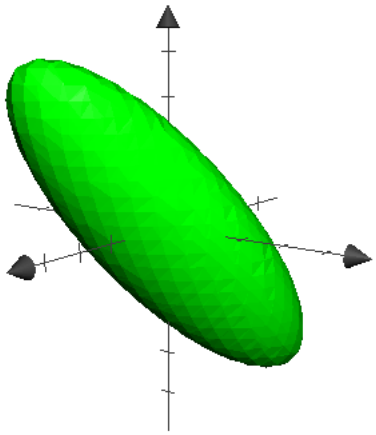
Name: _____

Time (circle one): 12:10 - 1:00 3:10 - 4:00

Consider the ellipsoid

$$5 = 2x^2 + 2y^2 + z^2 + 2xy - 2xz$$



This defines z implicitly as a function of x and y.

a. (4 pts) Using implicit differentiation, find $\frac{\partial z}{\partial x}$ as functions of x, y, and z.

   I.e., think of x and y as independent variables, so $\frac{\partial y}{\partial x} = 0$, whereas z is a dependent variable, so $\frac{\partial z}{\partial x}$ is probably non-zero (of course, $\frac{\partial x}{\partial x} = 1$ always). Then use the product rule to differentiate the equation with respect to x, and solve the resulting equation for $\frac{\partial z}{\partial x}$.

b. (3 pts) Is the point $(x, y) = (1, 0)$ in the domain of $z(x, y)$? If so, find all possible values $z(1, 0)$, and hence all possible values of $\frac{\partial z}{\partial x}(1, 0)$.

c. (3 pts) Is the point $(x, y) = (1, 2)$ in the domain of $z(x, y)$? If so, find all possible values $z(1, 0)$, and hence all possible values of $\frac{\partial z}{\partial x}(1, 2)$.

Please use extra paper as necessary. For each part, partial credit will be assigned based on correct work (you do need to show some work, enough so that I know how you solved the problem). Please simplify and $\boxed{\text{box}}$ your answers.