Name: _____

Directions: Show all work. No credit for answers without work.

1. **[2 points]** Find the first partial derivatives of the function $f(x, y, z) = x^2 e^{x/y} - 2xyz^2$.

2. **[2 points]** Find the equation of the tangent plane to $z = y \ln(x^2 + y^2)$ at the point $(0, 1, 0)$.

3. **[2 points]** The radius of a cylinder is measured to be 50 cm and its height is measured to be 100 cm. Both measurements have an error up to ± 0.5 cm. Use differentials to estimate the maximum possible error in the computed volume of the cylinder.

4. **[2 points]** Use the chain rule to find $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ where $z = x\sin(y^2)$, $x = s/t$, and $y = \cos t$. Note: you may leave your answer in terms of x, y, r, and s — no need to substitute to eliminate x and y.

5. **[2 points]** If $z = f(x - y)$ and f is differentiable, show that $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$.