Answer the problems on separate paper. You do not need to rewrite the problem statements on your answer sheets. Do your own work. Show all relevant steps which lead to your solutions. Attach this question sheet to the front of your answer sheets.

1. (8 pts) Let \( f(x, y) = (x + y^2)e^{x-y} \). Find \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \).

2. (25 pts) Let \( f(x, y) = (x^2 - y)\cos(xy) \). Find \( \frac{\partial f}{\partial x} \), \( \frac{\partial f}{\partial y} \), \( \frac{\partial^2 f}{\partial x^2} \), \( \frac{\partial^2 f}{\partial x \partial y} \), \( \frac{\partial^2 f}{\partial y^2} \) and \( \frac{\partial^2 f}{\partial y \partial x} \).

3. (12 pts) The formula for impedance in a circuit is \( Z = \sqrt{4X^2 + R^2} \). If \( X \) is measured to be 20.00 \( \Omega \) with an error of \( \pm 0.04 \Omega \) and \( R \) is measured to be 30.00 \( \Omega \) with an error of \( \pm 0.05 \Omega \), (use the total differential to) find the approximate maximum error in \( Z \).

4. (20 pts) Find and classify any possible maxima and/or minima of the function \( f(x, y) = x^2 - y^3 + 3x + 12y + 4 \).

5. (12 pts) Evaluate the iterated integral \( \int_0^2 \int_0^y (4y + 4x) \, dx \, dy \).

6. Omit

7. (12 pts) Use an iterated integral to find the area of the region \( R \) where \( R \) is the region in the first quadrant bounded by the curves \( y = \sqrt{x} \), \( x = 2 \) and the \( x \)-axis.

8. (12 pts) Find the volume of the solid in the first octant which lies above the triangular region bounded by the planes \( x = 0 \), \( y = 0 \), and \( x + y = 2 \) and below the paraboloid \( z = 4 - x^2 - y^2 \).