Instructions: Solve four out of the following five problems. If you attempt to solve all five problems, your grade will be calculated using your four highest scores. To earn full credit for your solutions you must show all of your work; partial credit will be awarded for substantial progress toward a correct solution. No notes, books, or electronic aids are permitted during the exams, and students are not permitted to communicate in any way.

Problem 1. (25 points)
Compute $\int_0^{\sqrt{\pi}} \int_0^{\sqrt{\pi}} \sin(x^2) \, dx \, dy$.

Problem 2. (25 points)
Compute $\iint_R 4xy \, dA$ where $R$ is the region in the second quadrant ($x \leq 0, y \geq 0$) between the circles of radius 1 and 3 centered at the origin.

Problem 3. (25 points)
Find the area of the part of the surface $z = x^2 + y$ that lies above the triangle with vertices $(0, 0), (1, 0)$, and $(0, 2)$.

Problem 4. (25 points)
Find the volume of the solid in the first octant bounded by the surfaces $z = 1 - y^2$, $z = y^2 - 1$, $x + z = 1$, and $x = 0$.

Problem 5. (25 points)
Find the mass of the solid bounded by the surfaces $x^2 + y^2 + z^2 = 25$, $x = 0$, and $y = 0$ whose density is given by the function $\rho(x, y, z) = (x^2 + y^2 + z^2)^{3/2}$. 