Show ALL your work. Please circle your final answers.

1. EVALUATE \( \int_0^1 \int_x^1 \sin(y^2) \, dy \, dx \).

2. EVALUATE \( \int_1^2 \int_y^2 e^{xy} \, dx \, dy \).
3. Set up a double integral in polar coordinates and evaluate it to find the area of the region in the first quadrant that lies between the circles \( x^2 + y^2 = 4 \) and \( x^2 + y^2 = 2x \).

4. Given \( \int_0^1 \int_y^{2-y} f(x, y) \, dx \, dy \), set up an equivalent double integral(s) with the order of integration reversed. DO NOT EVALUATE THE INTEGRAL(S).
5. Set up a triple integral(s) to find the volume of the solid bounded by the paraboloid \( x = 4y^2 + 4z^2 \) and the plane \( x = 4 \). DO NOT EVALUATE THE INTEGRAL(S).

6. Use triple integrals to find the radius of gyration about the z-axis for the solid bounded by \( x = 0, y = 0, z = 0 \), \( y = 1 - x \), and \( z = 1 - x^2 \). The density of the region is given by \( \delta(x, y, z) = 1 + x \). Set up all of your integrals so that the order of integration is \( dy \, dz \, dx \). DO NOT EVALUATE THE INTEGRALS.
7. Use the technique of Lagrange Multipliers to find the point on the plane \(2x - y + z = 3\) that is closest to the point \((-4, 1, 3)\).