1. Calculate

\[ \int_0^1 \int_0^1 x^2 ye^{x^3 y} \, dy \, dx, \]

\[ R = [0, 1] \times [0, 1]. \]

2. Find the volume of the solid bounded by the cylinder \( x^2 + y^2 = 4 \) and the planes \( y = z, x = 0, z = 0 \) in the first octant.
3. Evaluate the integral by converting to polar coordinates.

\[ \int_{-2}^{2} \int_{0}^{\sqrt{4-x^2}} \cos(x^2 + y^2)\,dy\,dx. \]

4. Let the lamina \( D \) be bounded by the curves \( y = e^x, \ y = 0, \ x = 0, \) and \( x = 1 \) with mass density function \( \rho(x, y) = 1 \). Find the moment of inertia \( I_x \) and the total mass \( m \).
5. Find the volume of the solid enclosed by the paraboloid \( z = x^2 + y^2 \) and the plane \( z = 9 \).

6. Evaluate the integral by switching to cylindrical coordinates.

\[
\int_{-1}^{1} \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{0}^{1-x^2-y^2} (x^2 + y^2) \, dz \, dy \, dx.
\]
7. Calculate
\[ \iiint_E z^2 \, dV, \]
where \( E \) lies between the spheres \( x^2 + y^2 + z^2 = 1 \) and \( x^2 + y^2 + z^2 = 4 \) in the first octant.

8. Use the given transformation to evaluate the integral.
\[ \iint_R (x^2 + xy + y^2) \, dA, \]
where \( R \) is the region bounded by the ellipse \( x^2 + xy + y^2 = 1 \); \( x = \sqrt{1/3}u + v \), \( y = \sqrt{1/3}u - v \).