1) For the integral \( \int \int e^{-x^2} \, dx \, dy \)

a) Sketch the region of integration
b) Reverse the order of integration
c) Evaluate the integral

2) Evaluate the integral \( \int \int xy \, dA \), over the region enclosed in the first quadrant, outside the circle \( r = 1 \) and inside the circle \( r = 2 \cos \theta \)

3) Using triple integration and cylindrical coordinates find the mass (\( \int \int \int \delta(x, y, z) \, dV \)) of the ellipsoidal solid \( 4x^2 + 4y^2 + z^2 = 16 \) lying above the x-y plane. The density at any point in the solid is given by \( \delta(x, y, z) = 10z \).

4) Find, using double integration, the area of the surface for the portion of the plane \( z = 24 - 3x - 2y \) in the first octant

5) For the region enclosed by the lines \( x - 2y = 0, x - 2y = -4, x + y = 4, x + y = 1 \) using the transformation \( u = x + y \) and \( v = x - 2y \)
a) evaluate the Jacobian
b) evaluate the integral \( \int \int xdx \, dy \) for the enclosed region above as double integral in the transformed \( u - v \) region

6) a) Evaluate the line integral \( \int_c (x + 2) \, ds \) where \( C \) is the curve represented by \( \mathbf{R} = 2t \mathbf{i} + \frac{4}{3} t^{\frac{3}{2}} \mathbf{j} + \frac{1}{2} t^2 \mathbf{k} \), \( 0 \leq t \leq 2 \)
b) Find the curl of the vector field \( \mathbf{F} = x^2 \mathbf{i} - 2xz \mathbf{j} + zy \mathbf{k} \) at the point (2, -1, 3)