

Ex. 1 Compute the integral $\iint_D x^2 \sqrt{x^2 + y^2} \, dx dy$, over the region $D = \{(x, y) : x^2 + y^2 \leq 1, y \geq x\}$.

Ex. 2 Compute the area of the region bounded by $y = x^2$, $y = -x^2 + x + 1$, using double integral.

Ex. 3 Compute the volume of the three-dimensional region A bounded by $z = \sqrt{x^2 + y^2}$, $z = 6 - (x^2 + y^2)$.

Ex. 4 Let $V = \{(x, y, z) : x^2 + y^2 + z^2 \leq 1, z \geq \sqrt{x^2 + y^2}\}$. Describe the set V by corresponding inequalities in the spherical coordinates.

Ex. 5 Find the general solution and determine its domain: $x^2 y^2 y' + 1 = y$.

Ex. 6 Find the general solution of the homogeneous differential equation and determine its domain:
 $4y'x^2 = x^2 + 4y^2$.

Ex. 7 Solve the initial problem: $y' + y = 2x$, $y(0) = 2$. Apply "guessing method".