

Calculus III
Practice Problems 9

1. Find the surface area of the part of the hyperbolic paraboloid $z = xy$ that lies inside the cylinder $x^2 + y^2 \leq 4$.
2. Find the surface area of the part of the hyperbolic paraboloid $z = y^2 - x^2$ that lies between the cylinders $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.
3. Find the surface area of the part of the surface $z = (2/3)(x^{3/2} + y^{3/2})$ that lies above the triangle in the first quadrant bounded by the line $x + y = 1$.
4. Find the mass and the x -coordinate of the center of mass of the solid bounded by the planes $x = 0$, $y = 0$, $z = 0$, $x + y + z = 1$ with the density function $\rho(x, y, z) = y$.
5. Find the center of mass of the piece of the solid parabolic shell $z \leq 16 - (x^2 + y^2)$ lying above the xy -plane.
6. Find the average value of $f(x, y, z) = x + y + z$ over the region R in the first octant (the region where all the coordinates are positive) under the plane $x + y + z = 1$.
7. The curve $z = (x - 1)^2$, $0 \leq z \leq 1$ is rotated about the z -axis, enclosing, together with the xy -plane, a 3-dimensional region R . R is filled with a substance whose density is inversely proportional to the distance from the z -axis. Find the total mass of this object.

8. Evaluate

$$\int \int \int_R (x^2 + y^2 + z^2) dx dy dz$$

where R is the ball $x^2 + y^2 + z^2 \leq 4$.

9. Find the centroid of the region R described in example 24, Chapter 17.