

Worksheet 14

1. A solid D is bounded laterally by the cylinder $x^2 + y^2 = 1$, above by the plane $z = 4$, and below by the paraboloid $z = 1 - x^2 - y^2$. The density $\rho(x, y, z)$ at any point (x, y, z) is equal to the distance from the point (x, y, z) to the z -axis (axis of the cylinder). Find the mass of the solid.

2. Compute

$$\int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{\sqrt{x^2+y^2}}^2 (x^2 + y^2) dz dy dx.$$

3. Compute

$$\iiint_B e^{(x^2+y^2+z^2)^{3/2}} dV,$$

where B is the unit ball: $B = \{(x, y, z) : x^2 + y^2 + z^2 \leq 1\}$.