

Math 2415

Homework on 15.8

1. Find $\iiint_E (1 + x + y^2) dV$ where E is the unit ball $x^2 + y^2 + z^2 \leq 1$.
2. Evaluate the integral $\iiint_E z dV$, where E is the solid bounded by the spheres $x^2 + y^2 + z^2 = 1$ and $x^2 + y^2 + z^2 = 4$ in the first octant.
3. Let E be the three-dimensional region bounded by the surfaces $x^2 + y^2 + z^2 = 4$ and $x^2 + y^2 = 1$. Compute the volume of E .
4. Find $\iiint_E (x^2 + y^2 + z^2)xyz dV$ where E is
 - (a) The ball $x^2 + y^2 + z^2 \leq R^2$
 - (b) The one-eighth ball $x^2 + y^2 + z^2 \leq R^2$ with $x \geq 0$, $y \geq 0$, and $z \geq 0$.

Here R is a non-zero constant. **Hint:** You can use symmetry to simplify the calculation for at least one of these regions.