

Practice Integrals in Rectangular/Cylindrical/Spherical Coordinates

Setup the following integrals in all reasonable coordinate systems. Compute each quantity in an appropriate coordinate system.

1. The volume the solid bounded by the planes $7x - 8y + 2z = 19$, $5x - y + z = 2$, $y = 3x + 8$, and $x = 4$.
2. The volume between $z = y^2 + 1$ and $z = 9 - 2x^2 - y^2$.
3. The mass of the solid that is bounded by the cone $z = \frac{1}{a}\sqrt{x^2 + y^2}$ and the plane $z = b$, and whose density is proportional to the distance from the z -axis.
4. The volume inside $x^2 + y^2 = R^2$ in the first octant, and below $z = 3x$.
5. The volume inside $x^2 + y^2 + z^2 = R^2$ and above $z = x^2 + y^2$.
6. The mass of the solid bounded below by $z = \frac{1}{a}\sqrt{x^2 + y^2}$ and above by $x^2 + y^2 + z^2 = R^2$, with density $\delta = 3e^{-(x^2+y^2+z^2)^{\frac{3}{2}}}$.
7. The volume inside $x^2 + y^2 + z^2 = 2z$ and below $z = 1 + \sqrt{x^2 + y^2}$.
8. The center of mass of the solid bounded by $z = \sqrt{x^2 + y^2}$ and $z = x^2 + y^2$, with density proportional to the distance from the z -axis.
9. The volume inside the cylinders $x^2 + z^2 = R^2$ and $y^2 + z^2 = R^2$.
10. The volume inside the cylinders $x^2 + z^2 = R^2$, $y^2 + z^2 = R^2$ and $x^2 + y^2 = R^2$.