1. (5.5.30 in Colley) Find the volume of the solid that is bounded by the paraboloid \( z = 9 - x^2 - y^2 \), the \( xy \)-plane, and the boundary of \([-1, 1] \times [-1, 1] \times \mathbb{R}\).

Solution. To find the volume of the region, we integrate 1 over the region. We calculate

\[
\text{volume} = \int_{-1}^{1} \int_{-1}^{1} \int_{0}^{9 - x^2 - y^2} 1 \, dz \, dy \, dx \\
= \int_{-1}^{1} \int_{-1}^{1} (9 - x^2 - y^2) \, dy \, dx \\
= \int_{-1}^{1} [9y - x^2y - y^3/3]_{-1}^{1} \, dx = \frac{100}{3}.
\]

\[\square\]