

Quiz 10 – MATH 3503 Fall 2022

Set up **but do not evaluate** the integral in spherical coordinates. Recall spherical coordinates:

$$\begin{cases} x = \rho \sin(\phi) \cos(\theta) \\ y = \rho \sin(\phi) \sin(\theta) \\ z = \rho \cos(\phi). \end{cases} \quad dV \longrightarrow \rho^2 \sin(\phi) d\rho d\theta d\phi$$

1.  $\iiint_B x^2 + y^2 + z^2 dV$  where  $B$  is the unit ball  $x^2 + y^2 + z^2 \leq 1$ .

2.  $\iiint_E x^2 dV$  where  $E$  is bounded by the  $xy$ -plane and the (upper-)hemispheres  $z = \sqrt{9 - x^2 - y^2}$  and  $z = \sqrt{16 - x^2 - y^2}$ .