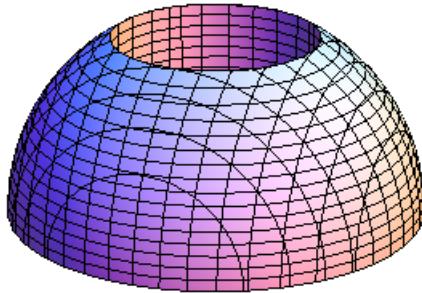


Worksheet 16**Cylindrical & Spherical Coordinates**MATH 2210, Fall 2018

1. The solid region E is inside the cone $z = \sqrt{x^2 + y^2}$ and under the paraboloid $z = 2 - x^2 - y^2$.
 - (a) Convert the cone and paraboloid equations to cylindrical coordinates **and** compute the values of r and z at the intersection of the surfaces.
 - (b) Using cylindrical coordinates, compute the triple integral $\iiint_E 2z \, dV$.

2. Find the volume of the solid that lies inside the sphere $x^2 + y^2 + z^2 = 2z$ and outside the sphere $x^2 + y^2 + z^2 = 1$.
- (a) Transform the sphere equations to cylindrical coordinates and plot the region of integration in the rz half plane.
- (b) Using spherical coordinates, compute the values of ρ and ϕ at the intersection of the two spheres.
- (c) Use a single triple integral in spherical coordinates to compute the volume of the solid.

3. Express the integral $\iiint_E (x^2 + y^2) dV$ in **spherical coordinates** and evaluate it. E is the solid located inside the sphere $x^2 + y^2 + z^2 = 4$, outside the cylinder $x^2 + y^2 = 1$ and above the xy -plane. Use the integration order $d\rho d\phi d\theta$.



4. Match each iterated integral with the appropriate graph by placing a letter (A, B, C, D, E, or F) in the box next to the graph.

A. $\int_0^{2\pi} \int_0^{\pi/2} \int_{1}^2 \rho^2 \sin \phi \, d\rho \, d\phi \, d\theta$

D. $\int_0^{2\pi} \int_0^2 \int_r^2 r \, dz \, dr \, d\theta$

B. $\int_0^{2\pi} \int_0^{\pi/4} \int_0^2 \rho^2 \sin \phi \, d\rho \, d\phi \, d\theta$

E. $\int_0^{2\pi} \int_0^{\sqrt{2}} \int_z^{\sqrt{4-z^2}} r \, dr \, dz \, d\theta$

C. $\int_0^{2\pi} \int_0^{\pi/3} \int_{1/\cos \phi}^2 \rho^2 \sin \phi \, d\rho \, d\phi \, d\theta$

F. $\int_0^{2\pi} \int_1^2 \int_0^{\sqrt{4-r^2}} r \, dz \, dr \, d\theta$

