

Today

- 15.7-8: Cylindrical and Spherical Coordinates (Understand the relationships among Cartesian, cylindrical, and spherical coordinates. Understand the development and use of dV in cylindrical and spherical coordinates.)
- WeBWorK

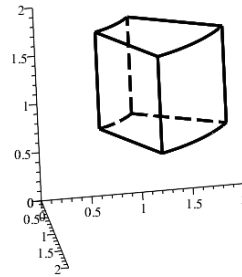
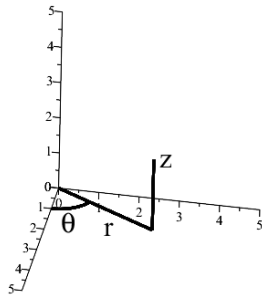
15.7-8: Cylindrical and Spherical Coordinates

- Cylindrical Coordinates: polar coordinates plus z .

(a) $x = r \cos \theta, y = r \sin \theta, z = z$

(b) $r^2 = x^2 + y^2, \tan \theta = \frac{y}{x}, z = z$

(c) $dV = r dz dr d\theta$



- Spherical Coordinates:

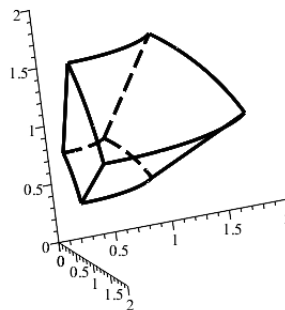
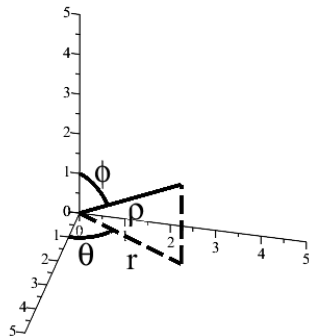
(a) $x = \rho \sin \phi \cos \theta, y = \rho \sin \phi \sin \theta, z = \rho \cos \phi$

(b) $\rho^2 = x^2 + y^2 + z^2, \tan \theta = \frac{y}{x}, \cos \phi = \frac{z}{\rho}$

(c) **Note:** $r = \rho \sin \phi$

(d) $\rho \geq 0, \phi \in [0, \pi]$

(e) $dV = \rho^2 \sin \phi d\rho d\phi d\theta$



3. Examples: Cylindrical: $\theta = \pi/3, z = 2, r = 1$
4. Examples: Spherical: $\theta = \pi/3, \phi = \pi/6, \rho = 1$
5. Examples p. 1004: #7, 8, 9, 10, 27, 28 20.
6. Examples p. 1010: #5-8, 14, 19-20, 39-40, 23, 26
7. WeBWorK:

Next Time

1. Watch 15.9 [\sim 46 minutes]