

Merit Worksheet 10 - Math 242, Fall 2005

1. **Polar Coordinates:** Which of the following regions resembles a quarter of a doughnut?

- (a) $0 \leq r \leq 5, 0 \leq \theta \leq \pi/2$
- (b) $3 \leq r \leq 5, 0 \leq \theta \leq 2\pi$
- (c) $3 \leq r \leq 5, \pi \leq \theta \leq 2\pi$
- (d) $3 \leq r \leq 5, \pi \leq \theta \leq 3\pi/2$

2. **Cylindrical Coordinates:**

- (a) Graph $r = 5$.
- (b) Graph $\theta = 3\pi/4$.
- (c) Graph $z = 7\pi/4$.
- (d) Mark the point $(5, 3\pi/4, 7\pi/4)$. What are its cartesian coordinates?

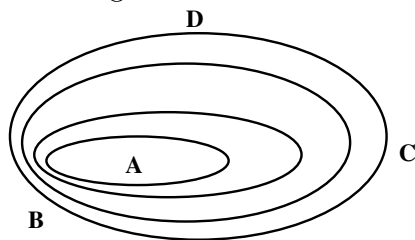
3. Which of the following regions represents the portion of a cylinder of height 4 and radius 3 above the 3rd quadrant of the xy plane?

- (a) $1 \leq r \leq 3, 0 \leq z \leq 4, 0 \leq \theta \leq \pi/2$
- (b) $0 \leq r \leq 4, 0 \leq z \leq 4, \pi \leq \theta \leq 3\pi/2$
- (c) $0 \leq r \leq 4, 0 \leq z \leq 3, \pi \leq \theta \leq 3\pi/2$
- (d) $0 \leq r \leq 3, 0 \leq z \leq 4, 0 \leq \theta \leq \pi/2$

4. **Spherical Coordinates:**

- (a) Graph $\rho = 5$.
- (b) Graph $\phi = 3\pi/4$.
- (c) Graph $\theta = 7\pi/4$.
- (d) Mark the point $(5, 3\pi/4, 7\pi/4)$. What are its cartesian coordinates?

5. Which of the following describes the bottom half of a sphere of radius 4 centred on the origin?
- (a) $0 \leq \rho \leq 4, \pi/2 \leq \phi \leq \pi, 0 \leq \theta \leq 2\pi$
 - (b) $0 \leq \rho \leq 4, 0 \leq \phi \leq \pi/2, 0 \leq \theta \leq 2\pi$
 - (c) $0 \leq \rho \leq 4, 0 \leq \phi \leq \pi, 0 \leq \theta \leq \pi$
 - (d) $0 \leq \rho \leq 4, 0 \leq \phi \leq \pi, \pi \leq \theta \leq 2\pi$
6. A solid ball of radius 2 is centred at the origin. A hole of radius 1 is drilled through the sphere with the axis of the hole lying on the z -axis. Describe the solid region that remains in
- (a) cylindrical coordinates;
 - (b) spherical coordinates.
7. The diagram shows the level curves of a function.



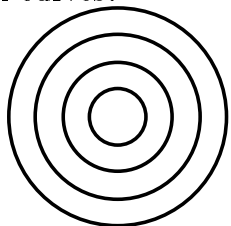
Which path will result in the greatest change in altitude? Which path is the steepest?

- (a) From A to B;
- (b) From A to C;
- (c) From A to D;
- (d) All the changes in altitude are about the same/ All the paths are the same steepness.

Pre-flight for Thursday

1. Find the largest possible domain of definition for the function $f(x, y) = \frac{xy}{x^2 - y^2}$.
2. Find $\lim_{(x,y) \rightarrow (0,0)} \frac{\cos(x^2 + y^2)}{1 - x^2 - y^2}$.

Can you think of two (or more) surfaces which have the following as their level curves?



Describe the level curves of the function $f(x, y, z) = x^2 + y^2 - z$.

Sketch some typical level curves of the function $f(x, y) = y - x^2$.

Problems 53 to 58, p.861. Match the level curve plots with the function.