

Math 233 - November 30, 2009

- Cylindrical Coordinates

1. Find the area of an “elementary polar region”:

$$\{(x, y) | r_1 \leq r \leq r_2; \theta_1 \leq \theta \leq \theta_2\}$$

$$A =$$

Lecture Problems

2. Find the cylindrical equation for the cartesian equation $x^2 + y^2 = 4$
3. Find the Cartesian equation for the cylindrical equation $z = 4$
4. Find the cylindrical equation for the Cartesian equation $x - y = 0$.
5. Find the cylindrical equation for the cone $z^2 = x^2 + y^2$.
6. Find the Cartesian equation of the cylindrical equation $r^2 + 4z^2 = 16$.
7. Find the Cartesian equation of the cylindrical equation $r^2 \cos 2\theta = z$.

$$\text{Hint: } \cos 2\theta = \cos^2 \theta - \sin^2 \theta.$$

8. Find the volume of the solid bounded above by the sphere centered at the origin having radius 5 and bounded below by the plane $z = 4$.

$$V =$$

9. Find the volume of the solid bounded above by the plane $z = y + 4$, below by the xy -plane and laterally by the right circular cylinder with radius 4 and whose axis is the z -axis.

$$V =$$

10. Find the volume of the solid inside $x^2 + y^2 = 4$, outside $x^2 + y^2 = 1$, below $z = 12 - x^2 - y^2$ and above $z = 0$.

$$V =$$