Math 251. WEEK in REVIEW 7. Fall 2013

1. Sketch the curve $r^2 = \cos 2\theta$. Find the area inside the curve.

2. Use a double integral in polar coordinates to evaluate the area of the region inside the circle $r=4\sin\theta$ and outside the circle r=2.

3. Use polar coordinates to evaluate

$$\int_{-1}^{1} \int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} \ln(x^2 + y^2 + 1) \, dx dy$$

4. Find the volume of the solid bounded by the surfaces

$$z = \sqrt{64 - x^2 - y^2}$$
 and $z = \frac{1}{12}(x^2 + y^2)$

5. (a) Find the mass of the plate bounded by $x^2+y^2=4$, $x^2+y^2=9$, if $x\leq 0$ and $y\geq 0$ if the density is $\delta(x,y)=\frac{y-4x}{x^2+y^2}$.

(b) Find the center of mass of the plate bounded by

$$y = x^2$$
 and $y = x$

if the density at any point is proportional to the distance from the y-axis.

6. Find the volume of the region bounded by the parabolic cylinders $z=x^2, z=2-x^2$ and by the planes y=0, y+z=4.

7. Write the equation $x^2 + y^2 + z^2 = 4y$ in cylindrical and spherical coordinates.

8. Convert the integral

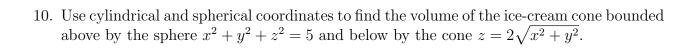
$$\int_0^1 \int_0^{\sqrt{1-y^2}} \int_{x^2+y^2}^{\sqrt{x^2+y^2}} xyz \, dz \, dx \, dy$$

to an integral in cylindrical coordinates, but don't evaluate it.

9. Convert the integral

$$\int_0^3 \int_0^{\sqrt{9-y^2}} \int_0^{\sqrt{9-x^2-y^2}} (x^2 + y^2 + z^2) \, dz \, dx \, dy$$

to an integral in spherical coordinates, but don't evaluate it.



- 11. Let E be the solid region bounded below by the cone $z^2 = x^2 + y^2$, $z \ge 0$ and above by the plane z = 4. Set up the integral for computing the mass of the solid if the density is $\rho(x, y, z) = xyz$ in
 - (a) cylindrical coordinates

(b) in spherical coordinates

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12. Find the center of mass of a solid right circular cone (the centroid of the cone) with height

H and base radius R assuming that the density is homogeneous.