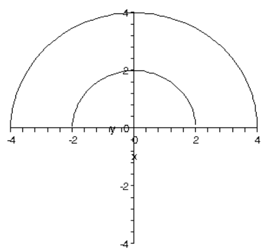
Practice Questions for Exam 3 **Math 231**

1. Describe/sketch the region whose area is given by the integral $\int_0^{\frac{\pi}{2}} \int_0^{2\sin\theta} r\,dr\,d\theta$.

2. Write $\iint_R f(x,y)\,dA$ as an iterated integral where R is the region shown below and f is an arbitrary continuous function on R.



3. Rewrite the integral $\int_{-1}^{1} \int_{x^2}^{1} \int_0^{1-y} f(x,y,z)\,dz\,dy\,dx$ as an iterated integral in order $dxdydz$.

4. Find the mass of the plane lamina bounded by $x = 2y^2$ and $y^2 = x - 4$ with density $\rho(x,y) = y^2$.

5. Set up the iterated triple integral, complete with correct limits, for the volume of the solid bounded by $y = 4 - x^2 - z^2$, $x = 0$, $y = 0$, $z = 0$, and $x + z = 2$. Do not evaluate the integral.

6. For the following double integral, sketch the region, reverse the order of integration, then evaluate.

$$\int_0^3 \int_{x^2}^9 x\cos(y^2)\,dy\,dx$$

7. Set up the iterated triple integral, with correct limits, to find the volume of the ice cream cone bounded above by the sphere $\rho = a$ and below by the cone $\phi = \frac{\pi}{3}$.

8. Find the volume of the solid inside the sphere $x^2 + y^2 + z^2 = 16$ and outside the cylinder $x^2 + y^2 = 4$.

9. Express the triple integral $\iiint\limits_T f(x,y,z)dV$ where T is the solid bounded by the surfaces $x^2+z^2=4,\ y=0,\ y=6$.

a. Set up the integral first integrating with respect to *x*, second with respect to *z* and then with respect to *y*.

b. Set up the integral first integrating with respect to *y*, second with respect to *z* and then with respect to *x*.

10. Describe a solid whose volume is equal to $\int_0^{2\pi}\int_0^3\int_{-\sqrt{9-r^2}}^{0} r\,dz\,dr\,d\theta$.

11. Convert to spherical coordinates and evaluate.

$$\int_{-2}^{2}\int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}}\int_{0}^{\sqrt{4-x^2-y^2}} e^{-\left(x^2+y^2+z^2\right)^{3/2}}\,dz\,dy\,dx$$

12. Set up the integral to find the area of the first quadrant region bounded by the lines $y=x,\ y=2x$ and the hyperbolas $xy=1,\ xy=2$, using the substitute $u=xy,\ v=\dfrac{y}{x}$.