

The Use of Calculators Is Not Permitted On This Exam

1. Consider $I = \int \int_R \sqrt{x^2 + y^2} dA$ where R is the region in the first quadrant bounded by $y = x$, the x axis and $x^2 + y^2 = 4$.
 - (a) Write I as an iterated integral or integrals (you may need more than one) with the order of integration first y , then x .
 - (b) Write I as an iterated integral or integrals with the order of integration first x , then y .
 - (c) Write I as an integral in polar coordinates.
 - (d) Evaluate I .
2. Find the area S of the portion of the surface $z = x^2/2 + \sqrt{8}y$ which lies directly above the triangle with vertices $(0, 0, 0)$, $(4, 0, 0)$ and $(4, 8, 0)$.
3. Set up a triple integral for finding the volume V of the region in the first octant bounded above by the plane $2x + y + z = 6$, on the sides by the hyperbolic sheet $xy = 4$ and below by the xy plane. Do not evaluate the integral.
4. A solid occupies the region in the first octant bounded above by the sphere $x^2 + y^2 + z^2 = 4$, below by the cone $z = \sqrt{x^2 + y^2}$ and on the sides by the planes $x = 0$ and $y = 0$. It has density $\delta(x, y, z) = x^2 + y^2$. Set up the integral for the moment M_{yz} of the solid about the yz plane:
 - (a) In rectangular coordinates.
 - (b) In cylindrical coordinates.
 - (c) In spherical coordinates.DO NOT EVALUATE.
5. Compute $I = \int \int_R y^2 dA$ where R is the region in the first quadrant bounded by the hyperbolas $xy = 1$ and $xy = 2$ and the lines $y = x$ and $y = 4x$ by making the change of variables $x = u/v$, $y = v$. (Answer: $I=9/4$.)