MATH 241H Dr. Wolfe SAMPLE THIRD HOUR EXAM Fall 2010

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 <u>triple</u> integral for finding the volume V of the region in the first octant bounded above by the cylinder $x^2 + z^2 = 16$, on the sides by the hyperbolic sheet $xy = 4$ and the plane $2x + y = 6$ 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_{xz} of the solid about the xz plane:

(a) In rectangular coordinates.

(b) In cylindrical coordinates.

(c) In spherical coordinates.

DO NOT EVALUATE.

5. Use the transformation $u = x + y$, $v = x - y$ to find

$$\int\int_R (x - y)e^{x^2-y^2}\, dA$$

where R is the rectangular region bounded by the lines $x + y = 0$, $x + y = 1$, $x - y = 1$ and $x - y = 4$.