

Exam 3

Handed out: Wednesday, 11/16/11

READ CAREFULLY. WORK ON ALL QUESTIONS. Justify your answers. Cross out what is not meant to be part of your final answer.

1. [10pts] By using a double integral, find the volume of the solid region (with straight vertical sides) that is bounded below by the region $\{|x| \leq 1, |y| \leq 1\}$ in the x - y plane, and is bounded above by a portion of the paraboloid $z = 4 - x^2 - y^2$.
2. (10pts) Evaluate the iterated integral

$$I = \int_0^2 \int_0^{\sqrt{4-y^2}} e^{x^2+y^2} dx dy.$$

3. [10pts] An object with mass density $\delta(x, y, z) = |z|$ occupies the solid region above the x - y plane between the spheres $x^2 + y^2 + z^2 = 1$ and $x^2 + y^2 + z^2 = 9$. Find the total mass of this object.
4. (10pts) By using a suitable change of variables, evaluate the integral

$$I = \iint_R \left(\frac{x-2y}{x+2y} \right)^2 dA,$$

where R is the region bounded by the lines $x - 2y = 1$, $x - 2y = 2$, $x + 2y = 1$, $x + 2y = 3$.