

North Carolina State University
MA 242 Section 008 Exam 3 Form 1

Read all directions carefully. **A graphing calculator may NOT be used on this exam.** You must Show All Work for credit and clearly indicate your final answer; no work equals no credit. When you are finished fold your exam, write your name on the outside, turn it in, and then you may leave quietly. Good Luck!

- 1) (15 pts) Set up (but **Do Not** evaluate) the integral in polar coordinates of the function $f(x, y) = (x^2 + y^2 + 1)^2$ over the 2d-region bounded by the curves $x^2 + y^2 = 4$ and $x^2 + (y - 1)^2 = 1$ in the first octant.
- 2) (25 pts) Evaluate the triple integral $\iiint_B e^{(x^2+y^2+z^2)^{3/2}} dV$ where B is the unit sphere $B = \{x^2 + y^2 + z^2 \leq 1\}$.
- 3) (20 pts) Integrate $\int_0^1 \int_{\sqrt{y}}^1 \frac{ye^{x^2}}{x^3} dx dy$.
- 4) (15 pts) Set up (but **Do Not** evaluate) the integral that would give the volume of the region bounded by the coordinate planes, $z = 1 - x^2$, and $y = 1 - x$.
- 5) (15 pts) Set up (but **Do Not** evaluate) the integral in cylindrical coordinates that will give the mass of the solid bounded by $z = 1 - x^2 - y^2$, $z = 3 + x^2 + y^2$, and the cylinder $x^2 + y^2 = 1$ when the density function is $\delta(x, y, z) = \sqrt{x^2 + y^2}$.

Question 6 is on the back of the test.

BONUS

(+5 pts) Using the coordinate change $u = x + y$ and $v = x - y$ integrate $\iint_R (x + y)e^{-x^2 - y^2} dA$ where R is the rectangle enclosed by $x - y = 0$, $x - y = 2$, $x + y = 0$, and $x + y = 3$.