

MATH 2210-90 Fall 2011

Third Midterm Exam

INSTRUCTOR: H.-PING HUANG

LAST NAME _____

FIRST NAME _____

ID NO. _____

INSTRUCTION: SHOW ALL OF YOUR WORK. MAKE SURE YOUR ANSWERS ARE CLEAR AND LEGIBLE. USE **SPECIFIED** METHOD TO SOLVE THE QUESTION. IT IS NOT NECESSARY TO SIMPLIFY YOUR FINAL ANSWERS.

PROBLEM 1 20 _____

PROBLEM 2 20 _____

PROBLEM 3 20 _____

PROBLEM 4 20 _____

PROBLEM 5 20 _____

TOTAL 100 _____

PROBLEM 1

(20 pt) Evaluate the integral

$$\int_0^4 \int_{x/2}^2 e^{y^2} dy dx.$$

PROBLEM 2

(20 pt) Using polar coordinates, evaluate the integral

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

where R is the xy - plane, $\mathbb{R}^2$.

(10 pt) **Bonus:** Find

$$\int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx.$$

PROBLEM 3

(20 pt) Find the area of the surface $z = x^2 + y^2$ below the plane $z = 9$.

PROBLEM 4

(20 pt) Find the volume and the center of mass of the homogeneous solid S that is bounded above by the sphere $\rho = 1$ and below by the cone $\phi = \pi/6$.

PROBLEM 5

(20 pt) Derive the change of variable formula

$$dx \, dy \, dz = \rho^2 \sin \phi \, d\rho \, d\theta \, d\phi$$

for the transformation from Cartesian coordinates to spherical coordinates.