MA-227/6D: Calculus III
Test#2, November 18, 2013

Time available: 110 min.
Each problem is 15 points

Your name (print):

Your signature:

Please always explain your answer, at least by including your calculations. You should work on this sheet. A right answer without calculation brings you no credit!

1. Calculate

$$\iint_R x^3 y e^{x^4 y} dA,$$

$R = [0,1] \times [0,2]$.

2. Find the volume of the solid bounded by the cylinder $x^2 + y^2 = 1$ and the planes $z = 0$, $z = x + 5$.

3. Evaluate the integral by converting to polar coordinates.

$$\int_{-1}^{1}\int_{0}^{\sqrt{1-x^2}} \sin(x^2+y^2)dydx.$$

4. Let the lamina D be bounded by the curves $y = e^{-x}$, $y = 0$, $x = 0$, and $x = 1$ with mass density function $\rho(x, y) = 3$. Find the moment of inertia I_x and the total mass m.

5. Find the volume of the solid enclosed by the paraboloid $z = 25 - x^2 - y^2$ and the plane $z = 0$.

6. Evaluate the integral by switching to cylindrical coordinates.

$$\int_{-2}^{2} \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{0}^{4-x^2-y^2} 2(x^2 + y^2) dz dy dx.$$

7. Calculate

$$\iiint_E z dV,$$

where E lies between the spheres $x^2 + y^2 + z^2 = 1$ and $x^2 + y^2 + z^2 = 9$ in the first octant.

8. Find $\iint_D x dA$, where

$$D = \left\{ (x, y) \middle| \, 0 \leq x \leq 1, \;\; x^6 \leq y \leq x^4 \right\}.$$